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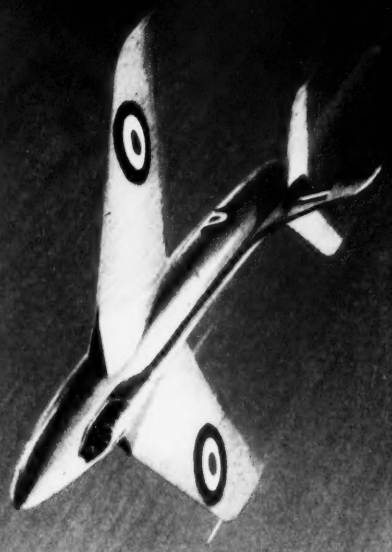

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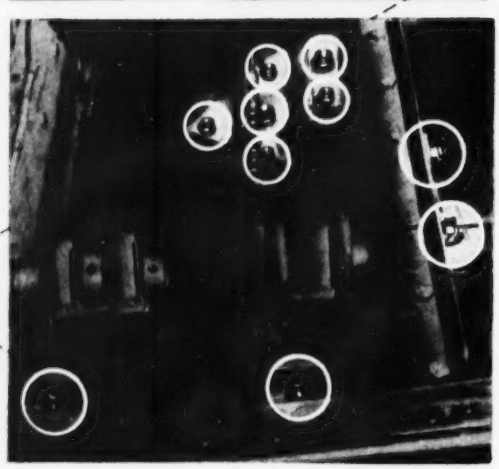

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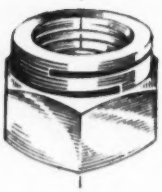

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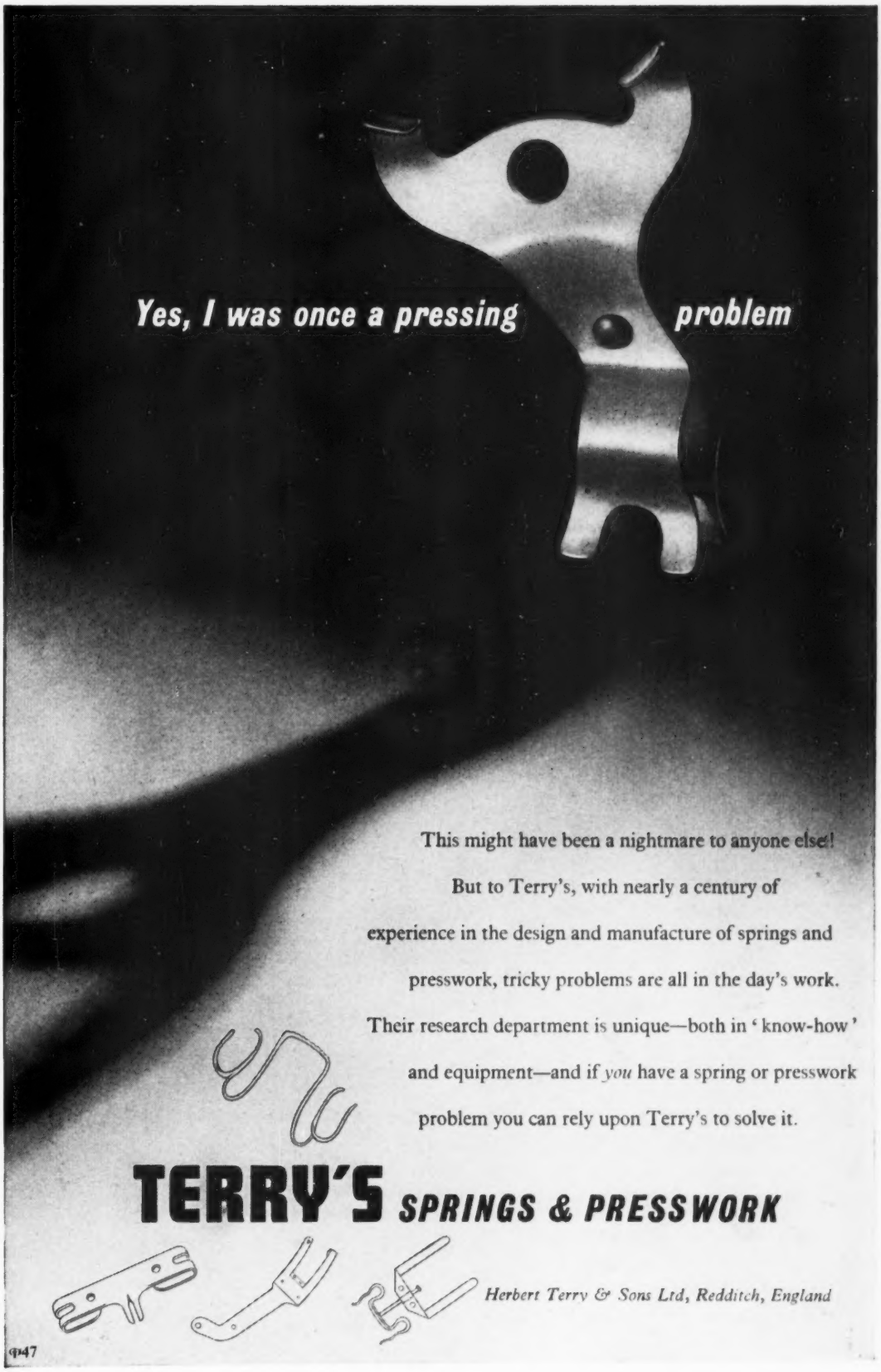
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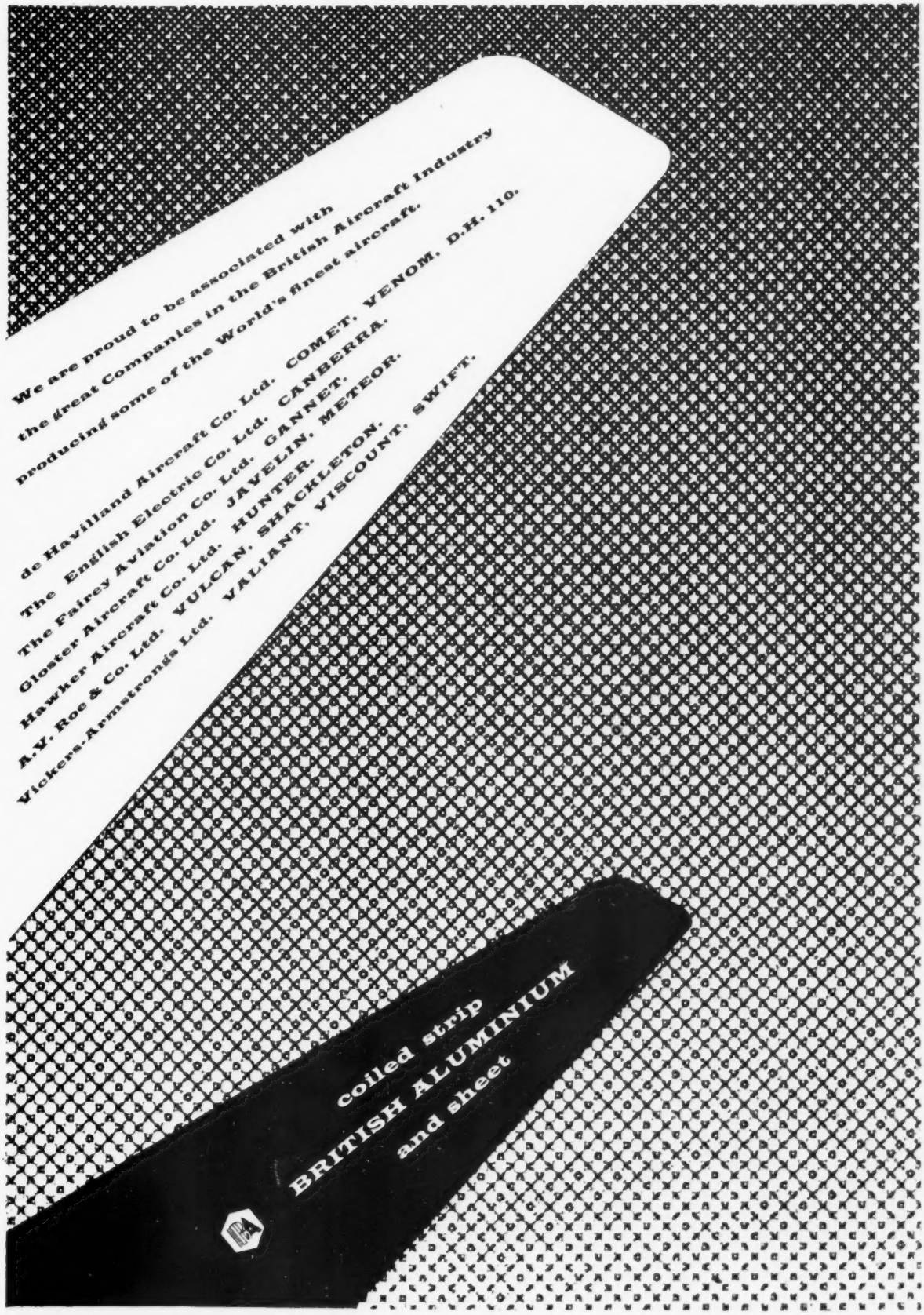
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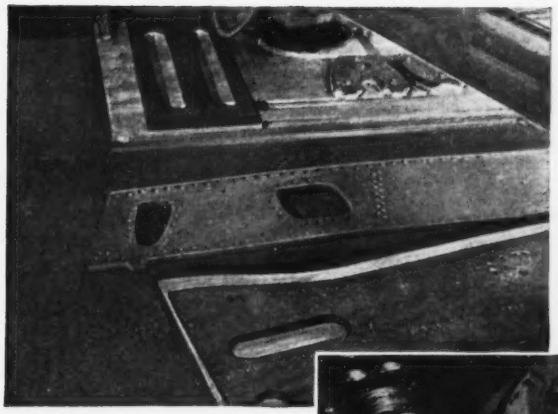

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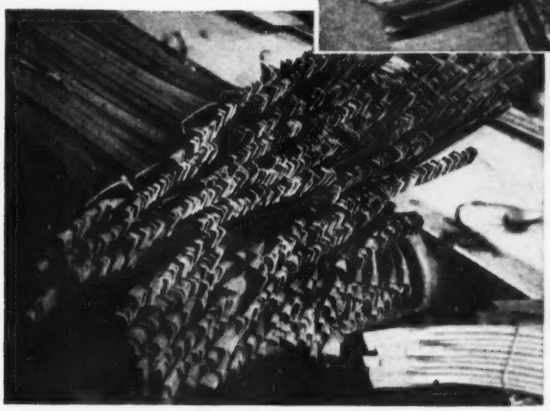

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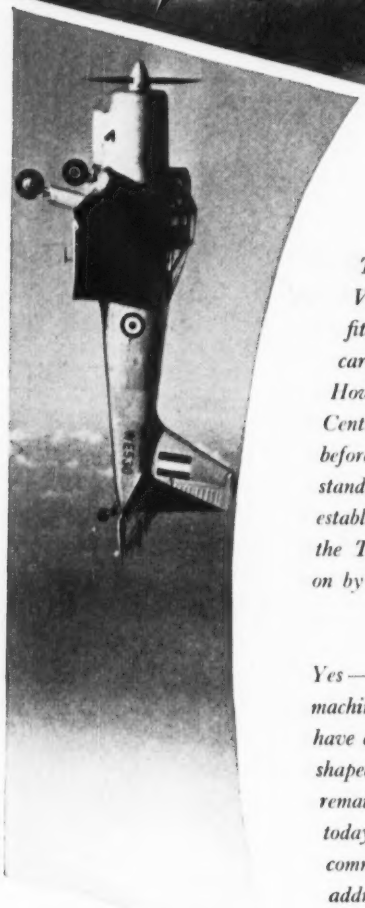

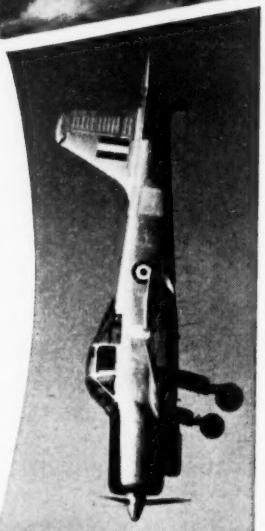

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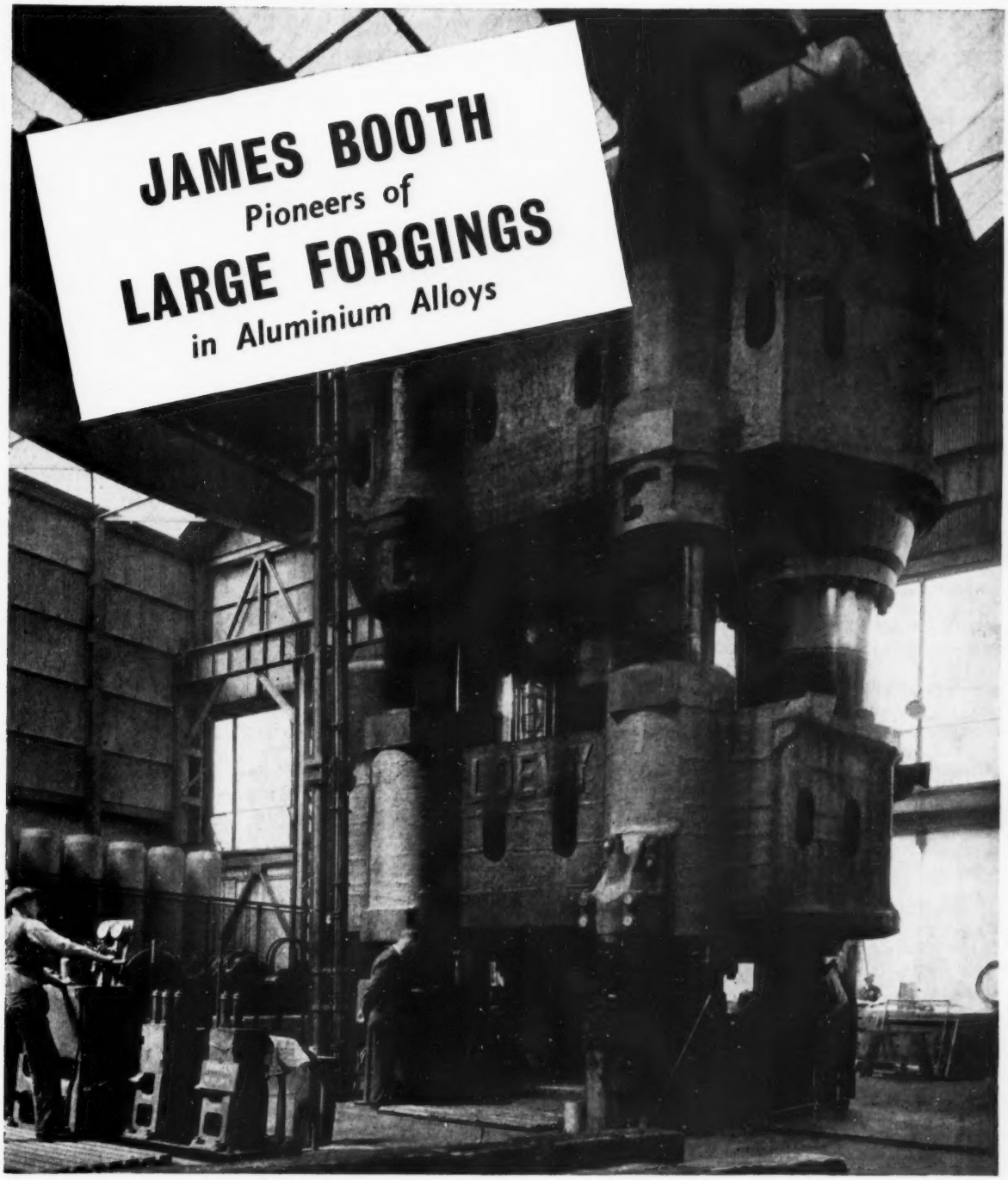

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Hands Off Bomber Command!

IT would be interesting to know what manner of men periodically launch rumours about the R.A.F. giving up its Bomber Command and leaving all the work to the Americans. We have refrained in the past from making any but the most superficial references to this sort of talk, but it seems to persist, if only in a few irresponsible or ill-informed quarters. It is mainly to those who may not have considered the implications of such suggestions that these few words are addressed.

For generations past the British Fleet has been the symbol of Britain's might. It has been our surest defence and, in a sense, a part of all of us. A century ago the sacrifice of the battle-line would have been unthinkable, no matter what its cost to the country's living standards. Fortunately no such occasion arose, nor has it arisen now. Today the Navy has lost none of its splendour; but a considerably greater potential danger than that from which it has protected our shores for centuries is now presented—by airborne atomic weapons. Fighters will play their all-important defensive part, but bombers must take over from battleships to be ready to fly out and destroy an enemy before he can launch his deadly attack.

Strained though the national finances are, there is stretch enough by cutting down on only a few luxuries to permit the maintenance of three times the size of bomber force now planned, should such a course be deemed necessary.

Many of us, when travelling in other lands, have experienced personally the degrading results of a foreign policy of weakness and appeasement. Unchristian though it may seem, those nations whose lot it is to lead and to set an example must be strong in arms as well as in principles. If they are not, they will receive little respect from the dictators and bullies and may be powerless to prevent the engulfment of their smaller and weaker allies, and even themselves.

To dispense with Bomber Command would be a definite step on the downhill path toward the demotion of Great Britain to a second- or third-class power. On our record as a nation we have a right to assume that our mature counsel and influence on international affairs is of value to all free nations, and such an unshouldering of responsibility would be a disastrous action.

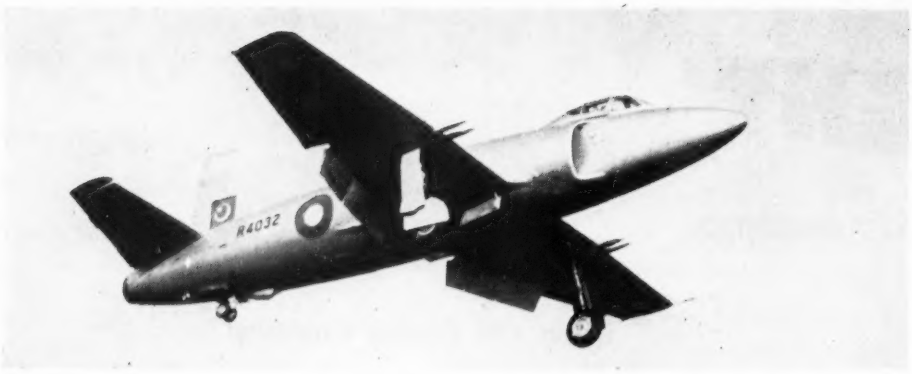
A recent suggestion closely allied to that discussed above is that the British strategic bomber force should be placed under outside control. We are pleased to note that the statement by Mr. Birch, Parliamentary Secretary to the Ministry of Defence, during the Defence Debate last week left no room for doubts. He said: "There is no truth whatever in the stories that the Americans are trying to stop us building medium bombers or that we do not intend to maintain our strategic bomber force under national control."

From the Defence Debate

Those portions of the Defence Debate which concerned air matters are reported by our Parliamentary correspondent on page 321. At a cost of about £300,000 each—and contrary to the implication by Capt. Waterhouse—the new British medium bombers for which small but super-priority orders have been placed can be considered cheap in relation to the power they represent and by comparison with the so much less effective defensive and deterrent forms of armament of earlier periods.

We were glad to see that the subject of transports and helicopters was raised by Mr. Orr-Ewing. The importance of mobility when large areas and small forces are concerned has been rightly stressed on many occasions. The numbers and types of transport aircraft that would be available to the Services in the event of war are quite inadequate, and very little is being done to increase them. Unfortunately, moreover, this class of aircraft is not eligible for American aid or off-shore procurement arrangements in the same manner as are the first-line types.

Several types of widely differing transport aircraft are required, ranging from those in the classes of the Vickers 1000 and the Beverley to helicopters and machines as small as the Ambulance/Freighter. Front-line strips as well as main runways need to be served, and at least one machine should be thoroughly suitable for dropping paratroopers.



"FLIGHT" Photographs

One of Pakistan's last four Attackers; this machine was demonstrated by test pilot "Chunky" Horne before Pakistan officials at South Marston.

PAKISTAN'S FINAL ATTACKERS

Last Batch Handed Over at South Marston Ceremony

ALTHOUGH designed primarily as a carrier-borne aircraft for the Royal Navy, the Attacker has been produced also in "de-navalized" form (we quote the makers' spokesman), for the Air Force of Pakistan. The R.P.A.F. order, placed in 1950, was completed on Friday last, March 6th, when the last two of the 36 machines ordered were handed over to His Excellency the High Commissioner for Pakistan, at the Vickers-Supermarine factory at South Marston, Wiltshire.

The opportunity was taken to hold a special luncheon on this occasion, at which the High Commissioner was the guest of Vickers' personnel concerned with the Pakistan order. Top management, test pilots, departmental heads and foremen were present; their guests included also Air Marshal Sir Colin Weedon, K.B.E., C.B., M.A. (representing Rolls-Royce, Ltd.); A. Cdre. R. Bowditch, C.B.E. (H.Q. Maintenance Command, R.A.F.); and G/C. A. M. Morad (Air Adviser to the High Commissioner).

Mr. R. P. H. Yapp (director) defined the occasion as the completion of the *first batch of Vickers aircraft* for the R.P.A.F.: he hoped other batches would follow. Close co-operation between Vickers and Rolls-Royce had been essential, he continued, and although A.V-M. R. Atcherley was unable to be present, a telegram of congratulation and best wishes had been received from him. Since the drafting of the original contract in 1950, goodwill on both sides had made possible a smooth execution of the order; in particular, members of the Pakistan Government staff in London had always dealt in a friendly yet effective manner with the problems which had arisen.

One clause in the contract had originally seemed a snag from Vickers' point of view. While they normally liked delivery ex works, delivery at Karachi had been specified. This, however, had been successfully carried out, great credit being due to the Vickers' pilots. Flight times to Karachi for the Attackers had varied from 10 hr 30 min to 14 hr 15 min, and had averaged 11 hr 40 min.

Concluding, Mr. Yapp pointed out that South Marston was the first British aircraft factory that the High Commissioner had visited: it was indeed an honour for the company. He was pleased to present to His Excellency, as a memento of the occasion, a model Attacker, mounted on an ashtray base.

Acknowledging with thanks the presentation, His Excellency Mr. M. A. H. Ispahani (the High Commissioner for Pakistan in the U.K.) said that throughout the execution of the contract the two parties had remained good friends, schedules had been observed, and there had been no delivery trouble—no small achievements in these days. He hoped that there would be a similar function in the future, to mark, possibly, delivery of Pakistan's last Swifts.

Following the luncheon, Mr. Ispahani and other guests were shown round the factory by Mr. S. P. Woodley, M.B.E. (superintendent, Supermarine works), Mr. J. Smith, C.B.E. (chief designer, Supermarine works) and other Vickers' executives. The visitors saw the last batch of Attackers for the Royal Navy in various stages of construction and completion, and the early Swifts now beginning to come off the production line. As the manufacture of Attackers is tailed off, the South Marston factory is changing over almost entirely to the production of the Avon-powered Swift.

From test pilots J. W. C. Judge and David Morgan, we heard details of the delivery flights made to Karachi by all members of the test pilot team in turn. Since deliveries began in 1951, some time had been spent in Karachi in instructing Pakistani pilots on the type; and indeed a small number of the Attackers had been flown out by R.P.A.F. pilots who had been thus trained at Karachi. The main differences from the standard naval version in the R.P.A.F. machines are the removal of the deck-landing hook and the "locking-down" of the wings.

After completing his tour of the factory, Mr. Ispahani drove out to the edge of the South Marston airfield, where, at the side of the control tower, in an almost-summertime sun, were aligned the last four of the R.P.A.F. Attackers. Trim in their crisp green-and-white markings, they formed a quiet yet powerful backdrop to the actual handing-over scene, as the High Commissioner signed the acceptance form for the last two machines.

Bad visibility at Chilbolton unfortunately prevented chief test pilot Mike Lithgow from appearing overhead in one of the lately-supersonic Swifts, and closing the Attacker door with a bang or two; but, as an effective finale, G. J. ("Chunky") Horne was present and willing to demonstrate the abilities of the capable Attacker to good effect.

Watched by high-level visitors and hosts in the control tower, Attacker R-4032's engine was quickly started and the aircraft taxied out, blowing the Wiltshire ground fiercely into faces and hair of the ground-level journalists. A take-off into the westerly haze was followed by an admirable series of high-speed runs, climbing and level rolls and other aerobatics, performed to the full benefit of the airfield's watching groups, and superbly planned and flown. After the landing, a hand-shake from the High Commissioner for the pilot, delayed only while an oily glove was removed, concluded the day's events.

(Left) Log-books of the last two machines being handed to the High Commissioner for Pakistan, Mr. M. A. H. Ispahani (right), by Mr. S. P. Woodley, superintendent of the Supermarine works. (Right) Horne taxies-in R-4032 after his aerobatic demonstration.

THE DEFENCE DEBATE

Mr. Churchill on "Off-the-Board" Aircraft Production

THAT production of aircraft "off the drawing-board" had become almost a normal procedure was one of the points made by the Prime Minister when, on March 5th, he initiated a debate in which the House of Commons was asked to approve the White Paper on Defence. (The air aspects of this document were summarized in our issue of February 27th.)

Mr. Churchill's speech followed in general outline the case set out in the White Paper, and particular reference was made to Services manpower, and the need to continue the two-year period of National Service. In this connection Mr. Churchill expressed the conviction that the matter of non-flying personnel in the Royal Air Force must be subject to continued scrutiny for any saving which would not detract from efficiency.

Perhaps the most significant passages of his speech, however, were those dealing with the economic and production aspects of the rearmament programme. He said that no one with a knowledge of the facts of our economic situation could challenge our claim that the defence effort was the absolute maximum of which the country was capable. Any further substantial diversion of our resources from civil to military production would gravely imperil our economic foundation and, with that, our ability to continue with the rearmament programme.

Mr. Churchill then referred to off-shore purchases, and the "serious and unpleasant" fact that this export trade had a retarding effect on the re-equipment of our own forces. There were, however, compensating advantages in that such exports established an extra war-production capacity.

Dealing with the Government's strategic review, he said that, as a result, the types and quantities of weapons and ammunition to be produced had been more precisely related to the kind of war or wars which might have to be fought in various parts of the world. This had enabled considerable economies to be made in many directions. To some extent these economies had reduced our overall defence expenditure and eased the strain upon the metal-using industries to which the Government looked for the needed expansion in our export trade. To some extent, also, they had made it possible, while keeping within the limits of what could be afforded, to redirect the money saved to the production of other more urgent and vital items of defence equipment.

The period of gestation required for the production of complicated modern equipment was a fairly long one. Even, therefore, in the case of weapons and aircraft already in production, the result of the changes would not in most cases affect the pattern of deliveries for about 12 months. For weapons still in the development stage the cycle was much longer; but, within the limits of our economic and technical resources and raw materials, rearmament was making good headway.

Over most of the field of research and development production was proceeding well; results were extremely encouraging, and the rate of delivery of aircraft and equipment in the case of flow production was, in most cases, satisfactory and up to expectation.

It was during this latter stage that modifications in design had to be introduced, often in the tooling-up period, and even when production had already started. With the growing frequency of new inventions, and in consequence of the increasing rapidity of obsolescence, going into production off the drawing-board—which still remained a risk—was becoming almost a normal procedure.

Mr. Churchill here commented that the time taken to cure defects which revealed themselves in tests and trials of prototype aircraft and specialized military equipment varied greatly from case to case and it was, therefore, not possible to generalize about progress in this intermediate stage. He assured the House that the Government would seek to find a solution to this ever-varying problem and that they were very much aware of the importance both of designing new weapons and of getting them as rapidly as possible into use. Never had this progress been so rapid and provided such opportunities for making mistakes.

Dealing with the supply of jet aircraft to Egypt and the other Arab States, and to Israel, Mr. Churchill said that this had been conducted on a very small scale and, so far as it had been carried out, fulfilled contracts entered into in the time of the Labour Government—when, no doubt, circumstances were somewhat different.

Nevertheless, there was a war four years ago between Israel and the Arab States, including Egypt. There was a truce on a somewhat precarious basis but no peace had been signed. The Government must be very careful, even on the small scale at present involved, not to alter in an appreciable way the balance between the two sides. Forty-three jet aircraft were sent to Egypt during the time of the Labour Government, and the present Government had agreed, while negotiations about the future were in progress, not to interrupt the supply. Four more had gone. This addition to the Egyptian air power made no difference to Britain's overwhelming air superiority in these regions.

Capt. C. Waterhouse (Con., Leicester S.E.) argued the case for a simplication of fighting equipment. He understood that the new medium bomber was to cost something like £300,000, which represented the production of 300 men for one year, and wondered whether such an elaborate machine as that was really necessary.

Mr. Charles Orr-Ewing (Con., Hendon N.) took up the same point in dealing with the new bombers—mentioned in the White Paper—which were to be produced in a transport version. These would obviously cost the best part of £1 million, and he believed that today there should be ordered, not such large and expensive aeroplanes, but smaller and cheaper aircraft with lower landing speed and shorter take-off runs. These were the sort needed in fighting a perimeter war, where small landing-strips—not miles of concrete—were available for take-off and landing.

Mr. Orr-Ewing then suggested that it would be advisable to begin the construction of strategic bases not only in this country but in one or two other selected places in the world—strategic bases where could be held the heavy maintenance and repair machinery needed in modern warfare, and the transport aircraft by which our troops could be moved to the various garrison bases around. If this conception was possible, regular recruiting could be encouraged by enabling married quarters to be built at these strategic bases.

He was also perturbed about the position in respect of helicopters of which he could find no mention in the Estimates. The U.S. Air Force had asked for 1,100 helicopters to be produced this year for the U.S. Army alone, and estimated that the manufacturing technique as a result of operational experience with these craft in Korea had advanced by five to ten years. Yet it seemed we were neglecting them almost completely. While the U.S. eventual allocation this year was £45 million for the purchase of helicopters, apart from the ten we received under M.S.A. there appeared to be orders from United Kingdom producers for only ten for the Royal Navy and ten for the Royal Air Force. He felt that recent experience of the floods had brought home that these aircraft would not only be invaluable for the technical battle, but might also be very important indeed for civil defence against atomic explosion.

Winding up the debate, Mr. Nigel Birch, Parliamentary Secretary to the Ministry of Defence, said that while America would remain the dominant atomic power—having the weapons and the means to deliver them—Britain did not wish to be altogether excluded from this field, and there were certain targets specially important to us which, in a hot war, we might wish to engage. We had exploded our first atomic bomb at Montebello; and in the Valiant, Vulcan, and Victor aircraft we had long-range medium bombers which we believed would be the best in the world. It was for that reason it had been decided to build up our light bomber forces to a lower peak than was originally intended and to go into production on the new long-range medium bombers. We would not have a very large strategic air force, but it would be very effective. Mr. Birch said there was no truth in reports that the Americans were against the build-up of our medium bomber force.

A.S.T.'s NEW DIRECTOR OF TRAINING

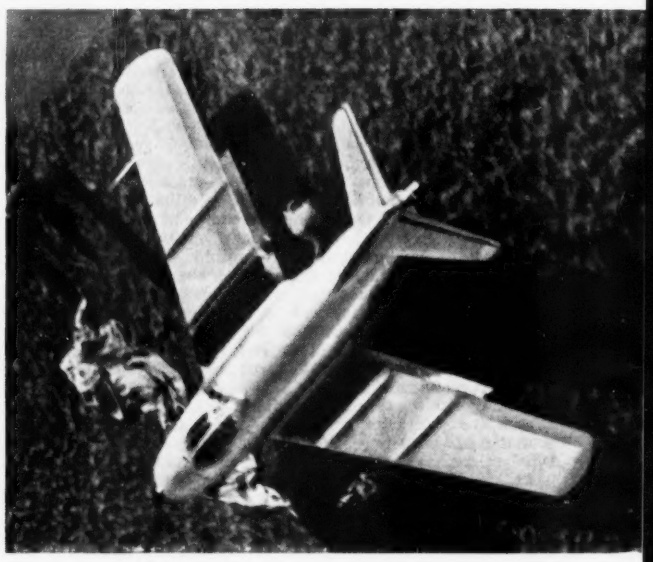
AS we briefly announced last week, G/C. Edward Warfield, C.B.E., D.F.C., who retired from the R.A.F. in January after 17 years' service, has been appointed director of training at Air Service Training, Ltd., Hamble.

After training as a pilot, G/C. Warfield—who is now 41 years of age—served with squadrons in Bomber Command before and during the war. Interspersed with squadron service were various Staff duties, culminating in an appointment as S.A.S.O. at No. 91 Group H.Q. from 1943 until 1945. He was appointed station commander of a Transport Conversion School, and in 1946 was posted to Air Staff Plans at A.H.Q., New Delhi.

After the partition of India, G/C. Warfield became the first Air Adviser to the British High Commissioner. He was then selected to attend a course at the Joint Services College in 1948, on completion of which he was appointed to the Directing Staff of the Royal Air Force Staff College. From 1951 until he joined A.S.T. in January last, he commanded a Meteor School in Flying Training Command.

His predecessor, W/C. H. F. Jenkins, O.B.E., A.F.C., was appointed to the A.S.T. flying school at its inception 21 years ago.

OFF-SHORE SECUREMENT: Two views of the Polish Air Force Mig-15 at Bornholm (see "A Present from Poland," below, in which various features are discussed). The exaggeratedly fat appearance in the plan view is probably due to the angle from which the photograph—apparently a very-low-altitude aerial view—was taken, plus lens distortion.



FROM ALL QUARTERS

A Present from Poland

THERE have been many instances in war-time of aircraft being captured intact because they have been landed, either accidentally or intentionally, within the territory of a Power particularly interested in securing a specimen. So far, the cold war has produced few incidents of this kind, though there have been two cases of Mig-15 pilots landing in poor visibility at Allied airfields in Germany (both realized their mistake in time to make a get-away) and in August, 1951, a comparatively intact Mig-15 was taken by the Royal Navy from shallow water off the Korean coast.

On March 5th, however, another Mig-15, the Polish pilot of which was said to be seeking asylum in a NATO country, put down on the 1,300-yard strip at Roenne Airfield, on the Danish island of Bornholm, which is only about 60 miles distant from Polish territory. According to his own story, it is reported, he was on a flight from Poland to East Germany in company with another Mig-15 when, over the Baltic coast, he jettisoned his auxiliary tanks and dived away seaward. He heard his companion give the news to base by R/T., and also heard, in reply, orders that he should be intercepted and shot down; but within six minutes he had reached safety.

The aircraft was at once placed under guard and the pilot, Franciszek Garecki, was later taken to Copenhagen for questioning. Senior Danish Air Force officers, accompanied by the British Air Attaché, W/C. F. R. Jeffs, A.F.C., flew from the capital to Bornholm.

In view of the fact that the Mig belonged to the air force of a Soviet satellite it seems unlikely that it is of the latest type; nevertheless, the photographs do indicate a number of detail departures from the Mig-15 as illustrated and described in some detail—from all available sources of information—in *Flight* of July 25th last year. The two most noticeable departures revealed are the fitting of a more heavily framed canopy, resembling that of the Swift, and the cutting-away of the tailpipe-end, Sabre-fashion. There are also perforated wing-flaps; small mass-balances can be discerned on elevators and at the rudder-tip; the air brakes, near the tail, are of different shape; and the full-chord wing fences (two on each side) are considerably deeper. A very high degree of polish can be seen on the wings, and it is noticeable that the Polish Air Force insignia on the fin are in red only, the usual white panels being omitted. Armament is quoted in a news-agency report as consisting of two 20 mm cannon—in contrast (if the information is correct) to the usual Mig-15 equipment of two 23 mm guns to port and one 37 mm to starboard.

The fact that the Bornholm machine carried live ammunition and a camera no doubt led the Danish Government to speak, last week-end, of "a serious violation of Danish territory" and to say that a thorough investigation would have to be made before the Mig-13 could be returned in compliance with a demand by the Polish Government.

It was decided to take the aircraft to Copenhagen and, as it could not be flown out of Bornholm, it was dismantled last week-end and taken in three lorry-loads to Roenne harbour. This immediately brought a new Note from the Poles, protesting that (a) the machine was being transported to Copenhagen, (b) it had been dismantled, and (c) the Danes had allowed "a foreign military attaché" to examine and photograph it.

Supersonic Swift

SINCE the paragraph on the Swift in "Aircraft Intelligence" (page 331) went to press, an official announcement by Vickers-Armstrongs has stated that the aircraft has exceeded the speed of sound "on a number of occasions," and that Mike Lithgow and David Morgan were the pilots on these flights.

For residents near the Supermarine airfields this comes as further confirmation of the news implied by the bangs they have been hearing recently. Listeners to the Western Regional B.B.C. services also received advance notice of the official statement; it came during a broadcast commentary of a recent football match at Swindon, when the alleged boredom of a quiet match was relieved by supersonic barracking from a Swift overhead. A triple bang has been reported.

Production Swifts have been flying for some months now and are expected to begin R.A.F. squadron service this summer.

Prize-giving at Farnborough

IN its comparatively short history the Technical College of the Royal Aircraft Establishment, Farnborough, has established itself as a most important source of training for engineers and craftsmen, and this was reflected in the distinguished array of aeronautical and Ministry of Supply personalities who attended the annual distribution of prizes last Friday.

The proceedings were opened by Sir Frederick Handley Page, C.B.E., F.R.Ae.S., F.C.G.I., chairman of the board of governors, who, in a brief introduction, stressed the great importance of not forgetting the cultural side of education in such a predominantly technical institution.

Mr. R. D. Peggs, M.A., M.I.Mech.E., A.F.R.Ae.S., the principal, then made his report—the tenth since the foundation of the college—in which he stated that the cultural side of life was in fact not neglected in the curriculum; and he then went on to enumerate the considerable number of academic successes gained by students during the past year. He was also able to mention the very favourable relationship which had grown up between college and local residents.

The various awards were then presented by Mr. A. R. W. Low, C.B.E., D.S.O., Parliamentary Secretary to the Ministry of Supply, deputizing at the last minute for the Minister himself,

COCKNEY CANBERRAS : English Electric Canberra B. Mk 2 bombers for the Royal Air Force are now rolling off the production lines at Handley Page factories. Seen here are three production aircraft. It was expected that the first would be delivered to the R.A.F. this week.

who was unfortunately not well enough to attend. The Grinstead prize for the best student of the year was won by J. B. Gilder, and there were quite a number of individuals who gained more than one award.

When all the prizes had been distributed, Mr. Low handed on one or two messages from the absent Minister, and then made some remarks of his own, in which he stressed the vital need for *production* engineers and craftsmen in the aircraft industry at the present time.

A vote of thanks was finally moved by Mr. A. F. Halstead, president of the Students' Union, in an interesting and—at times—supremely amusing address.

B.G.A. London Week-end

LAST week-end, representatives from the clubs forming the British Gliding Association met at Londonderry House to review progress. At the annual general meeting on Saturday the chairman (and world gliding champion), Mr. Philip Wills, recorded that the year had been a successful one, not only in the air but also financially. Viscount Kemsley and Sir David Brunt were re-elected president and vice-president, and Mr. Wills himself was re-elected chairman.

In another part of the building an all-day conference between the B.G.A. technical committee and the Association's approved inspectors was in progress. Under the chairmanship of Mr. Frank Irving, the procedure was reviewed by which the Association grants Certificates of Airworthiness under authority delegated by the Ministry of Civil Aviation. It seemed that the scheme was working well, and much useful information was exchanged on experiences with various fabrics, paints and other glider materials.

Among the week-end's events, undoubtedly the most wholly enjoyable was the Victory Ball held at Londonderry House on the Saturday evening. The victory being celebrated was, of course, that of the British gliding team in last year's World Championships. Guest of honour was Mr. J. D. Profumo, Parliamentary Under-Secretary to the Ministry of Civil Aviation, who presented the Association's 1952 trophies to the year's outstanding pilots.

The de Havilland Cup, awarded to S/L. A. A. J. Sanders for an absolute altitude of 16,050ft and gain of height of 13,830ft, obtained in an Olympia, was received by the pilot's parents in his absence abroad. Lt.-Cdr. Tony Goodhart received the Manio Cup for the best nominated-goal flight, made in a Meise from Basingstoke to Lympne, a distance of 93 miles. For the longest flight, Mr. Walter Kahn was awarded the Wakefield Trophy, having flown 138 miles from Lasham to Coningsby in a Weihe; while Mr. Geoffrey Stephenson's out-and-return flight of 104 miles between Lasham and Dunstable, in a Sky, won for him the Volk Cup. The Seager Cup for the best two-seater performance went to F/O. E. J. Meddings and F/L. J. W. Reilly who, in a T.21B, had flown 91 miles from Detling to Chilbolton. Referring to this last flight, Mr. Philip Wills expressed the belief that it was the longest flight yet made in "this device," the T.21B.

Also on view during the evening were the impressive World Gliding Championship Cup, and an attractive new club award, the Douglas Trophy for cross-country achievement, given by the Surrey Gliding Club. Following the presentation of the trophies, an excellent cabaret was staged by the London, Cambridge and Surrey clubs, with the solo-act help of a well-known gliding journalist, who cycled on to give, vigorously if precariously, his own bicycle-bell rendering of "Coal Black Mammy."

Dancing then continued until midnight. Col. R. Preston, secretary-general of the Royal Aero Club, and Mr. E. Bowyer, director of the S.B.A.C., were present, together with a large number of other supporters and pioneers of British gliding, representing many of this country's gliding clubs. Peter Brooks was seen earnestly discussing points of sailplane design over a scrawled envelope, Mr. Profumo enlarged to Philip Wills on the advantages of landing gliders in his constituency, and the kings, czars and inadequately-dressed ladies looked coldly down from their frames and pedestals on to the crowded ballroom.

On Sunday, March 8th, a conference was held of club instructors, 50 of whom have now been categorized by the instructors' panel of the B.G.A. The panel chairman, Mrs. Ann Douglas, presided. G/C. Christopher Paul gave an analysis of accidents which occurred in 1952, and a comparison with those of previous years. It was stated that the careful study of all accidents and the implementation of the recommendations by qualified instructors was having a good effect on gliding safety, although avoidable accidents still cost the movement £4,000 a year. Representatives of the Air Training Corps took part in the discussion, and a useful comparison of the various training methods was made. The number of clubs still using the solo training method is now very small, and it was generally agreed that the introduction of dual training led to better gliding.

More Target Tugs

ANOTHER batch of Fairey Firefly target-towing aircraft has been ordered by Svensk Flygtjänst of Stockholm, a civil organization which operates aircraft of this type for the Swedish armed forces. The present order brings up to 14 the number operating in Sweden.

Powered with early marks of Rolls-Royce Griffon, the Firefly target tug will tow a 16ft glider target continuously at 259 m.p.h. at 3,000ft; for 1 hr continuous flying the speed is 275 m.p.h., or 298 m.p.h. can be held for a short spell. The aircraft—which is used in Sweden with both 16ft and 30ft winged targets—is equipped with the standard B. Mk 2b windmill-driven winch carrying 7,000ft of cable

TO THE MEMORY OF GALLANT MEN...

Situated on a wooded hill overlooking the Thames at Runnymede, this dignified memorial is to be unveiled by Her Majesty the Queen on October 17th next. Above the three-arched entrance will be the inscription: "In this cloister are recorded the names of 20,456 airmen who have no known grave. They died for freedom in raid and sortie over the British Isles and the lands and seas of northern and western Europe." The memorial was designed for the Imperial War Graves Commission by Edward Maufe, R.A.

HERE AND THERE

GUNS AND BUTTER: Two impressive lines of Vampire Trainers in the main de Havilland assembly-shop at Hatfield, with dollar-earning Doves on the right. On the extreme left, almost out of the picture, is a Venom line, and beyond it—not visible—are Chipmunks.

About the Viscount

TO mark the inauguration of B.E.A. services with Viscounts, next week's issue of *Flight* (March 20th) will be an enlarged, specially illustrated, number, mainly devoted to these remarkable products of Vickers-Armstrongs, Ltd. British and foreign orders for Viscounts now total over 80.

In Appreciation

IN recognition of the help given by the people of Le Vigan, near Nîmes, France, in the search for a Wellington lost in the mountains on a flight from Hullavington to Istres on February 8th last year, the R.A.F. has presented a bronze plaque to the town.

Birthday

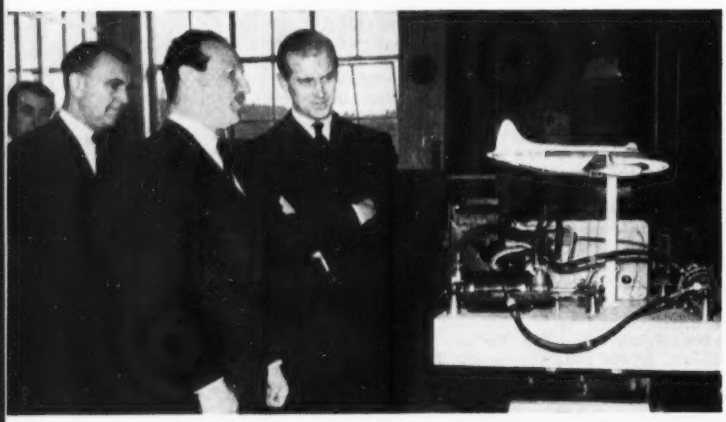
WITH its next issue (March 19th) our associated journal, *The Motor Cycle*, completes its 50th year of publication; the occasion will be marked by the appearance of a special Golden Jubilee Number telling the story of motor cycling almost from its inception.

Mystére Loss

THE French test-pilot, Charles Monier, lost his life when the Mystére which he was flying crashed at Istres on March 3rd.

Leicester Coronation Display

AS part of Leicester City Corporation's Coronation celebrations, the Leicestershire Aero Club is to hold a special flying display at Leicester East Airfield on Saturday, June 6th.



ROYAL INSIGHT: When H.R.H. the Duke of Edinburgh visited the Sperry factories on February 24th he showed—not surprisingly—a keen understanding of both aircraft and nautical equipment. In this picture he is seen watching a working demonstration of the Type A.L.1A Gyro pilot. In attendance are (left) Mr. R. Broadbent (director and general manager) and Mr. C. A. Richardson (aeronautical manager).

R.Ae.C. Film Show

THE next Londonderry House film show—and last of the season—for R.Ae.C. members and their guests is at 6.15 p.m. on March 16th. The programme will consist of three Scandinavian Airlines films, *The Flying Vikings*, *They Guide You Across* (about Atlantic weather-ships) and *This is Scandinavia*.

Magnetometer Oil Survey

USING a Canso amphibian equipped with a magnetometer—an instrument sensitive to changes in the earth's magnetic field—Aeromagnetic Surveyors, Ltd., are prospecting a large area of Papua, New Guinea, in a search for oil on behalf of two oil companies. The Canso's operators are the Canadian associates of Hunting Geophysics, Ltd., a subsidiary of Hunting Aerosurveys of London.

Royal Inauguration

YESTERDAY, March 12th, H.R.H. the Duke of Gloucester was due to open the new London premises of the R.A.F. Reserves Club.

For Warmer Ditching

A NEW immersion suit, of rubber-coated nylon, has been developed by the Canadian Institute of Aviation Medicine. Covering the whole body, including hands and feet, it weighs only 2 lb.

Flood Pictures

ARRANGED by the Air Ministry, an exhibition of photographs showing the part played by the three Services in the recent flood disaster is on view until March 31st at the *Evening News* West End Offices, 95-97 Regent Street, London W.1.

Air League Ball

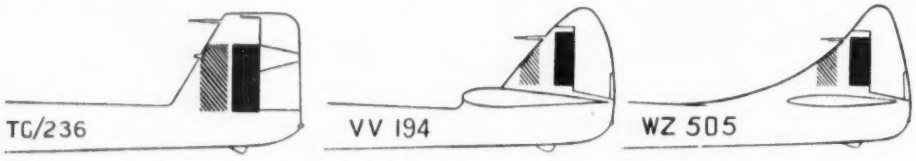
AN Aviation Jubilee Ball is to be held at the Dorchester Hotel, London, on Tuesday, April 28th, to aid the funds of the Air League of the British Empire. We shall shortly publish further details; in the meantime, it should be noted that tickets (£3 3s, inclusive of dinner) are obtainable from the organizer, Mrs. Madge Clarke, 79 Davies Street, London, W.1.

Wrong Way Round

IN the caption to a photograph of the Canberra crew at the Britannia Trophy presentation, published last week, the names of two members were unfortunately transposed: correctly, on the left was S/L. Watson and on the right F/L. Hillwood.

Sister Ship

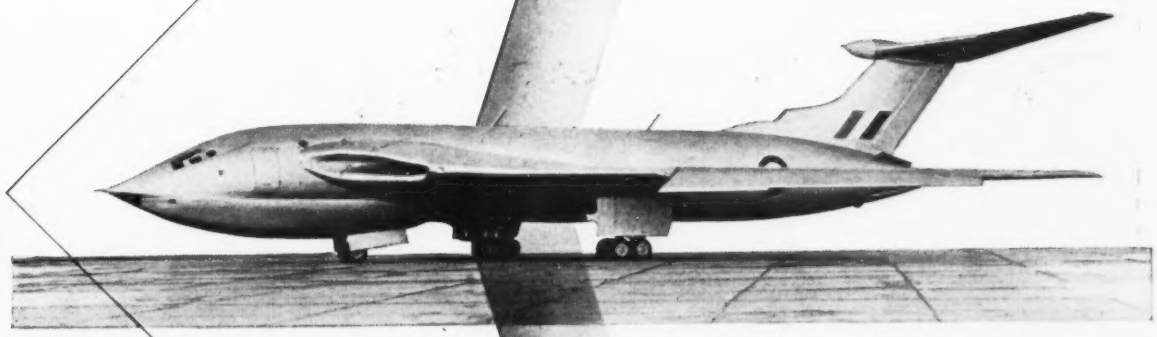
AT a recent meeting of the Bedford group of the Airship Club a subscription list was opened for the building of a sister craft to the 45,000 cu ft *Bournemouth*. Lord Ventry, president of the Club, said that the early troubles with the *Bournemouth* had now been overcome. He also told his audience that, had the war continued, U.S. naval airships for convoy protection would have been based in this country; a hangar at R.A.F. Station, Cardington, was actually cleared to receive the first four.



TAILPIECES: Evolution of the Vampire tail unit in (left to right) the F. Mk 1, F.B. Mk 5 and—with extended fin area—the T. Mk 11.

WORLD'S FIRST OPERATIONAL

CRESCENT BOMBER



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C.C.F. and R.A.F.

How the Combined Cadet Force Forms a Stepping-stone to Flying Training

Cadets of the R.A.F. Section of Fettes College C.C.F. carry out their primary glider in sections to the playing fields before assembling it for flying practice.

As most people know, the letters C.C.F. stand for Combined Cadet Force—the organization which has taken the place of the old O.T.C. at the Public Schools. Each C.C.F. comprises a basic section in which compulsory initial training is carried out, and three parallel advanced sections—Royal Naval, Army and Royal Air Force. The relative numbers of cadets in each of these three sections naturally varies considerably from school to school, though the Army section is usually the largest. The R.A.F. sections are run on the same lines as A.T.C. units, under the auspices of Home Command of the R.A.F., based at White Waltham. The various Groups subordinate to the parent Command are responsible for the operation and efficiency of the R.A.F. C.C.F. sections in their area, the sections themselves being officered by schoolmasters holding commissions in the R.A.F.V.R.(T).

Immediately after the war there was some decline in public-schoolboy enthusiasm for flying (and, indeed, for any other form of predominantly military activity), but in the last few years there has been a resurgence of interest. Official R.A.F. policy has been to further this trend by presenting all possible opportunities to cadets to gain practical experience of the flying and operation of various types of aircraft. The number of different schemes of which advantage can be taken by the boys is now very considerable, and lends much spice to the purely sedentary proficiency examination course that must be undertaken.

At gliding schools, dual instruction is available in side-by-side seat Sedberghs, followed by more in tandem-seat Cadet Mk IIIs. If a cadet shows sufficient aptitude, solo follows in the latter machine, and sometimes flights are made in single-seat Cadet Mk IIs. Instruction can be continued up to Proficiency Gliding Certificate standard—which is approximately equivalent to the B.G.A. "B" test plus three spot landings.

Gliding is also becoming possible on C.C.F. units' own sites, with the aid of the new Eton and Grasshopper primary gliders. These ingenious machines can be set up on vertical stands and, provided wind-speed is above 5 m.p.h., will bank and raise or lower their noses in answer to movements of the control column. When cadets are proficient in handling the controls in this way, the machines can be hand- or truck-launched with the aid of long elastic cables, and short flights can be made. Height is normally restricted to a few feet, but the gliders are, in fact, completely airworthy, and have been towed behind powered aircraft at heights of several thousand feet. They are also capable of soaring.

Each R.A.F. C.C.F. unit is affiliated to a Royal Air Force station, and thus cadets frequently have the chance to fly as passengers in any aircraft that may be available. Several times during the year, most units pay visits to R.A.F. stations or establishments of comparable interest, and these visits are frequently—though not always—laid on by the Pre-entry Training Liaison Officer at the unit's affiliated station. The Service has established a great reputation for the trouble it takes to make these visits as interesting as possible, and for the efforts made to provide the maximum number of cadets with air experience in different types of aircraft. The account of a visit to Boscombe Down, given at the end of this article, provides evidence of the truth of these remarks.

Two measures have been instituted for teaching powered flying. Firstly, at the Reserve Flying Schools, ten hours' dual can be obtained from V.R. instructors (the major object of this being to give the instructors practice). This scheme is unfortunately losing its scope with the demise of the R.F.S.s. Secondly, under the Flying Scholarship scheme, selected individuals receive 30 hours' flying, dual and solo, up to Private Pilot's licence standard. In addition to these opportunities, a few lucky boys are selected each year to go on reciprocal visits to Canada and the U.S.A. A party of two dozen or so is sent to each country, by air, for a couple of weeks' free visit—and similar groups come over here from the American continent at the same time. Trips with R.A.F. Transport Command are also laid on, and many cadets have been out to the Near East and Far East in this way.

Before cadets leave school they have the opportunity to go to

Cadets of the R.A.F. Section of the Eton College C.C.F. recently enjoyed a field day at Boscombe Down, as described overleaf. Some of them are seen (left) examining a Canberra, whilst on the right a cadet, under the watchful eye of an instructor, looses-off the four 20 mm guns of a Vampire.

C.C.F. and R.A.F. . . .

the Aircrew Pre-selection Centre at Hornchurch, and after spending two or three days there they are told at once whether or not they are suitable for training as aircrew (or, indeed, as ground crew). In the past this admirable arrangement enabled cadets to decide in advance whether it was worthwhile opting for National Service in the R.A.F. As is well known, however, it has been found uneconomic to train present-day aircrew for so short a period as two years' continuous service, and now no navigators and only a trickle of pilots are being accepted for this purpose. There is no difficulty, however, for cadets on leaving school to apply for short-service commissions (four and eight years), or for entry into Cranwell for permanent service in the R.A.F. The emphasis of Air Ministry policy is now on encouraging boys to do one or other of these things.

A Field Day at Boscombe Down

RECENTLY the cadets of the R.A.F. Section of the Eton College Combined Cadet Force were fortunate in being allowed to visit the Aeroplane and Armament Experimental Establishment at Boscombe Down for one of their field days. Everyone interested in aviation would like to be able to visit this establishment, but only the privileged are usually successful—and it is to be hoped that the boys realized how much they owed to A. Cdre. A. H. Wheeler, O.B.E., the Commandant of the station, for permitting such an unusually interesting expedition.

Immediately upon arrival, the party was split into groups of about eight cadets, who were conducted round the tarmac by aircrew officers from the A. and A.E.E. squadrons. Many different types of aircraft were to be seen—Canberras, Wyverns and a Shackleton Mk II; various Meteors, a Beaver and a Firefly; some Vikings; and, at the far end of the line, a great, gleaming cigar of metal—the Handley Page Victor itself. This was a great moment for the visitors, though, naturally, a detailed inspection was not possible.

Next came an excellent lunch, and afterwards a visit to the blower tunnel on the other side of the field. Here four Merlins are harnessed to airscrews that can deliver a blast of air at well over 250 knots, so that baling-out and similar problems can be worked out on the ground before being attempted in the air. An impressive demonstration was given of the roof escape-hatch of an aircraft sailing up and back when jettisoned from inside the cockpit. Then on—after a quick look at some helicopters—to the firing butts, where a new cannon (which may provide some of our super-priority fighters with their punch) was demonstrated with deafening effect. In the next bay of the butts a Vampire was jacked up ready for gun tests, and four lucky boys were able between them to loose off the 600 rounds of ammunition that were scheduled for destruction.

During the visit described in this article, all the cadets were given a flight in a Viking. Three of them are seen here discussing the aircraft with a member of the ground staff before the flight.

Finally back to the tarmac, and a flight in a Viking for all concerned. While this was in progress, the Victor was seen to take-off smoothly along the vast runway, and land again, equally smoothly, a little later. And so to tea, and away in the bus—truly a memorable field day, and one which could hardly fail to impress the cadets with the possibilities of modern Service flying.

THE C.P.A. COMET LOSS

UNTIL official findings are made public, it seems unlikely that anything useful can be added to the news—briefly given in our pages last week—of the tragic loss of the C.P.A. Comet 1A, *Empress of Hawaii*, with 11 lives, in a take-off crash at Karachi on March 2nd. There appears to be general agreement that the aircraft—which was on its delivery flight to Australia—failed to leave the runway, much of which it covered in a tail-down position.

On the following day, three de Havilland representatives—Messrs John Cunningham (chief test pilot), Peter Mourits (of the D.H. Engine Co.) and Peter Detmold (of the servicing organization)—left for Karachi by a B.O.A.C. Argonaut service in order to assist in the investigation.

The Canadian Pacific Airlines crew consisted of Capt. C. H. Pentland, director of the company's overseas flight operations; Capt. North Sawle, chief pilot, oversea line; and Messrs. R. J. Cook, radio navigator; P. D. Roy, chief navigator; and J. H. Smith, chief mechanic. The passengers were five de Havilland technical specialists—Messrs. D. H. Edwards, chief liaison engineer; H. Waters and D. Morgan-Tipp, senior service engineers; B. W. H. Rees, flight engineer; and J. A. B. Wilson, a Ghost engine specialist—and Mr. N. H. Gardiner, of Smiths Aircraft Instruments. Some biographical notes appear below:—

CHARLES HOWELL PENTLAND was, by virtue of his career, well known to B.O.A.C. flying personnel. Born in Canada in 1910, he began his professional flying in 1933 on charter work in the North-West Territories. He came to England in 1937 to join Imperial Airways and, after a period of service as a first officer, was attached to Railway Air Services as an acting captain. From the spring of 1939 he flew Short Empire flying-boats on various routes, and, after transferring to Liberators in April 1942, was engaged mainly on return ferry services from Dorval to the Middle East, Russia and the United Kingdom. On his appointment as officer in charge of B.O.A.C. training at Dorval soon after the war he had completed 124 Atlantic crossings; and he continued to fly trans-atlantic services on Stratocruisers, bringing this total to about 200; Capt. Pentland left B.O.A.C. in February 1949 to join C.P.A., at first as Pacific manager and later as director of overseas flight operations. He leaves a widow and a son.

DAVID HUMPHREY EDWARDS, who was born in 1912, had been a senior D.H. service engineer since 1937. He had pre-war experience on the D.H. Albatross and Flamingo, and assisted in the development of the Mosquito. He was D.H. liaison engineer with the R.A.F. throughout the war. At the time of his death he was chief liaison engineer of the organization's aircraft side, and had been responsible for setting up maintenance and overhaul bases for Comets and Ghost engines in the Pacific area. He leaves a wife and two sons.

HAROLD WATERS was born in 1908 and joined the experimental department of the de Havilland Aircraft Co. in 1938. He had previously gained experience on electrical equipment and instruments with a Portsmouth firm, and later with Vickers-Armstrongs, Ltd. He served overseas with the R.A.F. in the war, and was on the maiden flight of the Comet prototype in July 1949. Mr. Waters was married, but leaves no children.

DENNIS MORGAN-TIPP, born in 1923, received training at the D.H. Aeronautical Technical School. From 1946 he worked for the D.H. Engine Company on Ghost, Goblin and Gipsy engines. In 1948 he was station engineer at Freetown with West African Airways, operators of the Dove. He was the first engineer in the world to obtain an aircraft engineer's licence for a jet-engined airliner, having joined the service department of the D.H. Aircraft Co. late in 1949. He leaves a wife and two children.

BASIL REES, born in 1923, left Halton as a first-class apprentice in 1941. He saw active service with the R.A.F. overseas and was a flight engineer on Stirlings and Lancasters, also serving with Transport Command for four years as a flight engineer. He joined the service department of the D.H. Aircraft Co. in 1950, and subsequently became a Comet flight engineer, in which grade he accumulated a total of 2,000 hours' flying. Mr. Rees was married, with no children.

JOHN ALEXANDER BORTHWICK WILSON was born in 1928. After service in the Fleet Air Arm he joined the D.H. Aeronautical Technical School in 1947. In 1951 he entered the service department of the Engine Company and was attached to B.O.A.C.'s Comet Unit at London Airport in 1952 as a specialist on the Ghost. He held a private pilot's licence.

NORRIS HEYWOOD GARDINER, aged 32, a senior technical service representative of Smiths Aircraft Instruments, had been with that company for seven years. It was his principal duty to further the performance of their aircraft products in the hands of users at home and abroad, and he was on his way to spend two months with C.P.A.

The Helicopter Pilot's Viewpoint

Some Candid Criticisms at Helicopter Association's Discussion

UNDER the auspices of the Helicopter Association of Great Britain, a discussion on "Helicopter Flight Testing Experiences" was held in London on Friday evening, March 6th. W/C. R. A. C. Brie, A.F.R.Ae.S., A.F.I.Ae.S., a council member, was chairman of the meeting. We present here, in shortened form, the three main papers: two by test pilots, and the third by a member of the B.E.A. Helicopter Unit. The open discussion which followed will be summarized in a later issue.

THE first paper, "Early test flight in the Bristol 173 Helicopter," was presented by C. T. D. ("Sox") Hosegood, the chief helicopter test pilot of the Bristol Aeroplane Company. In his opening remarks Mr. Hosegood said that for the sake of clarity he had segregated the "173" trials under the following headings:—

(1) Engines and rotors run at low power with the collective-pitch lever locked at zero, but azimuth and rudder controls free.
(2) Engine and rotors run at high power with all the flying controls free (collective-pitch lever unlocked) and the machine tied down firmly with a rope harness.
(2b) A repetition of the previous condition, but with the geometry of the ropes so arranged that the nose wheels could rise some four feet off the ground, the machine being securely tied to prevent movement beyond this height, or in any other direction.
(3) Taxying of the machine.
(4) Take-off vertically to a hovering position within the ground cushion, and a check of the controls for effectiveness. (After this there was to be a substantial halt while additional ground running, followed by a complete inspection, was made.)
(5) Further hovering and slow movements in all directions, keeping within the ground cushion.
(6) Forward flight, eventually climbing out of the ground cushion and descending again.

All concerned were alive to the hazards of tethered flight which might be encountered during the tethered running, but there was no alternative if the effectiveness and forces of the flying controls (particularly the collective pitch lever) were to be checked before the machine was actually committed to the air.

Following this procedure some ground-resonance troubles were experienced almost at once, resulting in some slight structural damage to the machine, This brought to light a weakness in the rear undercarriage which was rectified at a conveniently early time. Happily, before the resonance occurred enough had been learned about the controls to make further tethered flying unnecessary. After a limited amount of satisfactory ground taxying stage 4 was reached. Here the lecturer explained that when the "173" takes off normally the front wheels leave the ground first and are some four feet clear of the surface before the rear wheels become airborne.

On the first attempt he and Keith Turner, who was acting as observer, felt a resonant condition building up while the front wheels were clear of the ground and the rear undercarriage lightly loaded. By promptly reducing collective pitch, closing the throttle and applying the rotor brake, damage was avoided. Several minor modifications were tried and, by greatly increasing the rear-wheel tyre pressure, they were able to get the machine into the air for the first time on January 3rd, 1952.

The machine itself was, on this occasion, made as light as was compatible with a central C of G loading. Both the fore-and-aft and lateral trimming bias were set at neutral. The fore-and-aft trimmer (which in effect governs the c.g. and therefore the attitude of the machine) was set slightly aft of what was estimated to be the correct position. An "unstick" indicator was fitted which told the pilot when the rear wheels were clear of the ground.

The first entry into the air was made at an alarmingly steep angle, due to underestimating the effectiveness of the c.g. trimmer. The lecturer said he felt a certain embarrassment in finding the whole of the Brabazon runway before him, with a definite reluctance on the part of the helicopter to do anything but move slowly backwards. However, by a small alteration of the trimmer the attitude was corrected and all the other troubles with it.

After further resonance trouble that followed the second flight, on January 4th, there was a long interval while the whole problem of resonance was examined. During this time the remaining ground running was satisfactorily completed. The machine was not ready to fly again until the end of July, but by this time a most careful resonance investigation had been completed, which resulted in a slight modification to the damping system of the rotor heads, and a fairly extensive modification to the undercarriage.

The next task was to make sure the resonance trouble had in fact been cured, and to this end a number of landings were made under various conditions. At no time were there any signs of the previous trouble, and the new undercarriage was found to be quite satisfactory.

Up to this time the helicopter had been turned through 360 deg and moved slowly sideways, backwards and forwards, but no serious attempt at forward flight had been made. Now this stage had been reached and with a walkie-talkie mounted on a truck to follow the aircraft down the runway, the first serious attempt to fly forwards was made. As soon as the speed began to build up the tail appeared to want to drop, and no amount of forward trim and/or forward stick would prevent it. As the attitude had become unhappily steep, and in some respects the machine was out of control, all collective pitch was thrown off and the aircraft dropped back on the runway. This resulted in a very heavy landing indeed, but no signs of resonance. It was certainly the most severe test to date. An alteration of the basic collective pitch between the two rotors was then made to improve the ratio of "mixing" between cyclic tilt and collective pitch. The "mixing" was necessary (explained the lecturer), because, in a tandem helicopter, unlike a single rotor helicopter, the tilting of the rotor disc alone would not give sufficient control throughout the desired speed range. However, by so arranging matters that in addition to tilting the rotor discs a differential collective pitch setting is introduced, a very powerful control is obtained.

The next attempt at forward flight was more successful, but at a comparatively low speed the aircraft developed a yaw to the left. This was discovered in the middle of August, with the S.B.A.C. Show at Farnborough only thirteen days off! The fault was remedied by tabs on the trailing edge of the tailplane, and the aircraft could then be flown forwards with reasonable control. Many runs were made along the runway, gradually getting faster and faster, but always stopping before the end of the runway was reached, and never going above about seventy feet.

A short further delay was caused by the failure of an auxiliary piece of test equipment but on August 24th, Keith Turner and the lecturer had the pleasure at long last of flying up the runway and not stopping at the end of it.

They flew straight on to the river Severn, and then made a large sweeping circuit to the right and landed again. The test programme proper had yet to begin, but a stage had been reached which enabled the machine to be taken into the air with reasonable safety and flown, if necessary, from A to B. It was the first chapter of a long book.

HIGH-ALTITUDE AND INSTRUMENT FLIGHT

THE second paper was then presented by S/L. W. R. Gellatly, flight commander of the Helicopter Flight at the Aircraft and Armament Experimental Establishment. He discussed some handling problems of high altitude and instrument flight as they affected the present military use of helicopters.

Already the helicopter was required to operate at what we call high altitudes (say 10,000-19,000ft) in certain military and development rôles. New or improved power-plants, increased speeds and range, world-wide operation and weather flying, all tended to push the effective service ceiling higher. As a general example of conditions imposed by today's requirements, helicopter flight at Nairobi which is 5,000ft a.m.s.l. could be cited. The summer temperature and the relatively lower air density makes this equivalent to 8,000ft I.C.A.N. Apart from performance considerations, the effect on handling characteristics could be significant with such an increase of height.

In fixed-wing flight the real effects of high altitude on manœuvre could be considered above say 30,000ft. The effect of height upon helicopter manœuvre could be a reckonable factor as low as 8,000ft I.C.A.N. On all types of helicopters now in service, some degree of deterioration in handling characteristics could be observed with increase of height. To the pilot this was usually manifest in increased airframe vibration, increased sensitivity of the rotor to pitch and power changes, and a strong impression of deterioration in longitudinal static and dynamic stability.

More serious in effect upon manœuvre was the need for a change of flying technique at high altitudes. Due to the increase of rotor speed with height for a constant pitch/power setting, the worst case experience rendered autorotative flight above 8,000ft (in a design overload condition) impossible without stopping the engine. The increase of rotor r.p.m. with height required such a high pitch position in autorotation that, even at minimum permissible I.A.S., power transmission could not be separated at maximum rotor r.p.m. Full autorotation must be possible up to

THE HELICOPTER PILOT'S VIEWPOINT . . .

the designed maximum speed for height, as the highest attainable rate of descent might be needed in icing conditions or combat manœuvres.

Regarding fuselage attitude and stability, the usual cases considered were the assumption of autorotative flight following an engine failure, and a rapid descent followed perhaps by a powered climb as an evasive manœuvre. The greatest changes to flight attitude in a helicopter occurred in the pitching plane. Although longitudinal and lateral stability were somewhat interdependent, the lecturer considered the longitudinal case separately in high-altitude flight. The longitudinal stability of the helicopter varied with speed and was partly dependent on the damping of rotor and fuselage. With lowered density at height the damping was reduced, and general operating indicated that air speeds were usually below the stable speed range. Stability characteristics could never be described as comfortably positive, and any deterioration was a serious matter.

To the apparent effect of reduced damping to disturbances was added the reduced control-response through lack of available power and the increased rotor sensitivity. The pilot had, therefore, either to avoid rapid and large changes of the flight condition or to know his aeroplane extremely well. If such a longitudinal change, of an order quite normal at low altitudes, was made near the ceiling the resultant pitching could become dangerously divergent. The effect then of the consequent accelerations on rotor speed could be difficult to counter, and control phasing to regain a steady condition could be quite extraordinary.

Each of the described effects was in itself a mild limitation, but together they formed a serious restriction upon manœuvrability. There appeared, then, to be a requirement for more detailed forms of high-altitude-manœuvre boundaries than those at present given in designers' flight envelopes. The lecturer suggested that the parameters of speed, thrust and disc-loading were conditioned by control response and translational rates during entry into manœuvres, besides the effect of relative density at any height. The laborious construction of some form of boundaries, including this information, was needed in the endless quest for safety in flight.

On the subject of instrument flying, S/L. Gellatly went on to say that the need for development of flight instruments was well recognized. If the scope of helicopter operations could be extended safely in any way there should be no delay in taking advantage of the possibility. A basic standard in training, presentation and procedure should be aimed at which, while allowing an acceptable measure of instrument flight now, would be capable of adaptation to likely developments and eventually to unrestricted blind operation.

The following tests covering all reasonable conditions of blind flight were at present applied to an aircraft type. The same tests might be given to a pilot as part-examination of his proficiency for flight under I.F.R.

Fig. 1. The precision pattern for helicopter flying described by S/L. Gellatly, of the A. and A.E.E. Helicopter Flight, in his lecture.

The simple pattern (Fig. 1) resembled the fixed-wing rating test pattern "B," and it fulfilled a similar purpose. Flight on a limited panel with gyroscopic instruments obscured; recovery from unusual positions; simulated engine failure; transition to steady autorotation; transition from autorotative to powered flight; controlled let-downs; these were also subjects of assessment on instruments.

Generally speaking, the restrictions on helicopter instrument flight today were due to flight-instrument limitations and the inherent instability of the machine in manœuvre The stability of the single-rotor type in manœuvre could be considered as satisfactory at speeds above that for minimum power (V_{imp}). Below the V_{imp}, and particularly in the very low speed range, large divergencies from the flight-path could occur very quickly. A characteristic helicopter oscillatory motion in rough air varied in magnitude more or less directly with the degree of turbulence and was caused particularly by the effect of gusts on lateral rather than longitudinal stability. As speed was reduced, the rate of turn for a given angle of bank increased, so that small lateral displacements caused by rough air could produce rapid deviations from heading. Further, in any changing flight state, the differential-pressure instruments lagged, therefore the condition to be corrected was in advance of the indication. As a result, slow-speed flight under blind conditions was usually affected by coarse control movements which led to over-corrected and inaccurate flight. Another consideration in slow-speed flight was that of position-error correction changes with changes of flight condition. On one type this was 11 kt between a steady climb and steady autorotation at 20 kt I.A.S.

The V_{imp} on the pure helicopter was usually about 0.45 of the maximum permissible speed (V_{max}) and if this was the lowest cleared limit for instrument flight it would represent a big restriction, particularly on the controlled or aided steep night approach. The normal power/speed curve indicated relatively small changes of power between say 0.7 and $1.3V_{imp}$. It seemed reasonable, therefore, to reckon on safe instrument flight down to 0.7 V_{imp} as the lower speed limit.

Determination of the upper speed limit was more definite. Having regard to vibration characteristics it seemed convenient to limit the top speed under I.F.R. to 0.8 V_{max}.

The next step was to consider some aspects of control in the acceptable speed range. Due to stability characteristics the pilot could never relax from constant instrument interpretation, which resulted in early fatigue. If this strain could be relieved in any way the period of possible continuous accurate instrument flying would be increased. The advantage given by a measure of longitudinal and lateral stick-free stability, however it was produced, was considerable, and the lecturer suggested that positive longitudinal and lateral stick-free static stability, positive stick-force gradients and ample trimming range would be requirements for an I.F. clearance to Service aircraft. The likely unusual flight positions in a helicopter were few in comparison with fixed-wing aircraft, as stalls and spins could hardly be encountered.

Power failure of the gyroscopic instruments and complete engine failure were the emergency cases to be considered. In the former case, gentle manœuvres should be possible by use of the ball and compass. A better stand-by indicator of lateral level was needed; the suction-type turn-and-slip needles were hopeless in any turbulence. The electric instrument seemed to be much more suitable, and there might be a good case for its inclusion on the interim standard I.F. panel. Rapid transition from powered to autorotative flight must be possible on instruments. In practice this was an uncomfortable manœuvre, as there was generally an immediate change of position-error to be allowed for, and the pilot must take care not to induce any violent pitching when rectifying the difference.

The prerequisite to safe instrument-flight within any aircraft limits would always be a suitable standard of pilot training. The tests described for an I.F. clearance to type might form the basis of an instrument-rating scheme for helicopter pilots, and some such scheme could be framed soon as a move towards the fuller use of helicopters. Ratings could be valued "white" and "green" and be endorsed "H" as valid for all types, fixed or rotary wings, on which the holder was qualified to fly under suitable weather limits and rating privileges.

The lecturer concluded by referring to some lines of instrument development which did not rely on the character of any airstream. They showed considerable promise, he said, and it seemed that successful instrument flight at very slow speeds would only be possible on the "wandering-spot" type of indicator.

B.E.A. DEVELOPMENT FLYING

THE third paper was then read by Capt. J. A. Cameron of the B.E.A. Helicopter Unit, who dealt with development flying from the civil operator's point of view.

In November, 1951, the lecturer began, the B.E.A. Helicopter Experimental Unit received its first British helicopter—a Bristol 171 Mk 3. This machine was on loan from the Ministry of Supply for the purpose of carrying out the initial civil development flying. Information required by the Ministry from B.E.A. was set out in a loan agreement, part of which was as follows: "To obtain an overall assessment of the Bristol 171 helicopter from the viewpoint of operation as a civil aircraft, including: (1) Operating speed; (2) comfort (noise and vibration levels); (3) ease of handling; (4) pilot utilization as determined by fatigue; (5) Suitability for carriage of luggage and freight."

Any criticisms of this aircraft relate to the prototype as operated

by the Unit over the past year, and as a result of these criticisms production 171s could be expected to be modified to eliminate all such small defects.

The maximum forward speed for the Type 171 as laid down by the M.o.S. was limited to 112 kt or 129 m.p.h., at which speed the aircraft was just on the present world's speed record for helicopters, currently held by the Americans. At this speed, in common with other helicopters, large vertical vibrations manifested themselves, plus an increase of cabin noise-level, which detracted from the pleasantness of the machine. A slight reversal of trim was also noticed at high speeds. The 171 cruised nicely at 80-85 kt, which compared favourably with other helicopters in production today. Fuel consumption rose steeply with the increase of power for speeds above 80 kt. To enable operators to take full advantage of the speed, it would be a good thing if the onset of rich mixture could be delayed, so that a speed of 90 kt could be used economically.

The 171, which flies in a level attitude in cruising flight, might well prove popular with the travelling public. One cause of adverse passenger comment with the S-51 was the numerous draughts entering the cabin. Unfortunately, the prototype 171 was no better, but no doubt production aircraft would not have this shortcoming. The noise level inside the 171's passenger cabin was comparable with that of other helicopters, being in the region of 100 db in cruising flight, but this figure was capable of being reduced by a considerable amount.

When the main rotor was properly tracked, the first-order rotor vibration could be completely eliminated, and the aircraft was smooth and pleasant to fly. If the main rotor was even slightly out of track, however, unpleasant vibrations could be felt, especially at speeds over 85 kt. Vibration records showed that the vibration characteristics of the 171 were of a lower order than those of the S-51. In fairness to the S-51 it should be pointed out that this was a machine of 1947 vintage, the main rotor of which had fabric-covered blades. The more up-to-date version with metal blades and servo controls was a great improvement on the original.

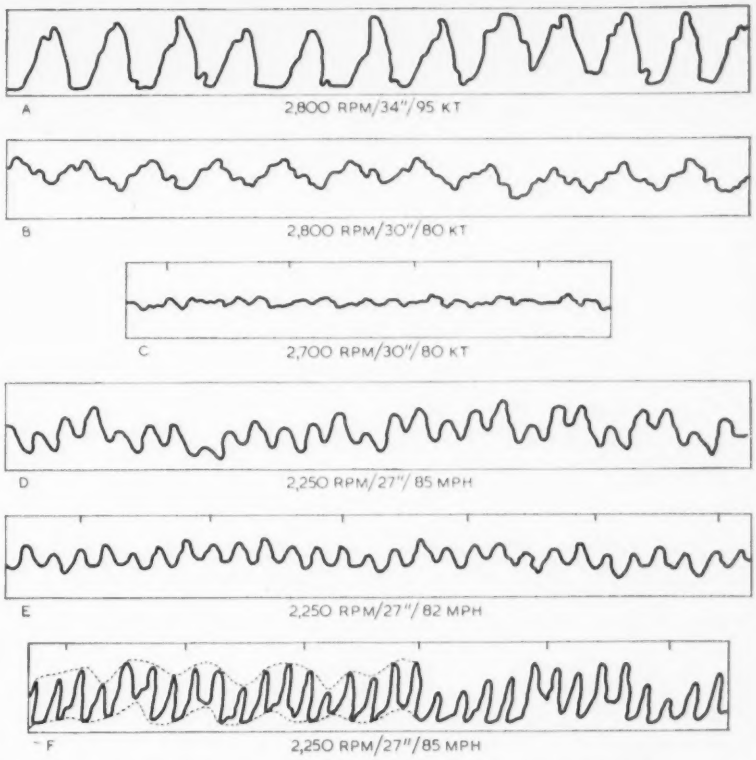


Fig. 2. Helicopter vibration records taken with Kelvin vibrograph: (A, B, C) Bristol 171, vibrograph mounted vertically above instrument panel: severe and moderate first-rotor components, and the absence of this component after tracking are respectively shown. (D, E, F) Sikorsky S-51, vibrograph mounted vertically adjacent to pilot's seat (D and E), and above instrument panel (F). These show, respectively, first component superimposed on third, first component reduced after tracking, and large-amplitude vibrations of first, third and higher frequencies.

The handling qualities of the 171 were good, and the aircraft was popular with pilots. Control column forces could be trimmed out, and the helicopter flown, for short periods, completely "hands off." A certain amount of desirable longitudinal stability was present during cruising flight. One important point in respect of handling was the excellent behaviour of the 171 in autorotation, and when carrying out engine-off landings. Under the worst possible conditions, i.e., at maximum all-up weight, on a hot humid day in still air, the machine could be brought down in perfect safety from 500ft with a short forward run of some 20-30 yd or so.

Engine starting on the 171 could be improved. In low outside temperatures, it was difficult to start the engine and, once started, a very lengthy warm-up period, perhaps more than 20 min, was required to reach minimum oil temperatures. Conversely, when the engine was hot, it was difficult to start without inadvertently engaging the rotor, with consequent rotor snatch and strain on the transmission system. Quick turn-round times on the ground at rotor stations was undoubtedly an important feature of helicopter operations, and to this end the efficiency of the rotor brake could be improved.

The question of ice accretion was also of great importance. The lecturer digressed to give a short resumé of the position. No provision, he said, had as yet been made for the installation of any de-icing system to the rotors or control surfaces on any of the present-day British production helicopters. During the winter of 1951, he had rather an interesting experience of ice accretion on one of the Unit's Bell 47s. He found difficulty in hovering after a normal run-up. The engine was developing full power, but the rotor and engine revs. started to fall off immediately on take-off, and in less than a minute he found himself back on terra firma. There was absolutely no vibration on the cyclic-control column, and the only symptom of ice accretion, apart from the drop in revs., was that the stick seemed slightly heavy. The rotors were stopped, carefully examined and found to be coated with clear ice. The pattern of the formation on the main and tail rotor blades was very interesting. At the tips of the main blades the leading edges were found to have a thin coating of clear ice, building up considerably along the leading edges towards the centre portion of the blades, and falling off completely towards the roots. The tail blades had a thick coating on the leading edges at the roots, thinning out towards the tips.

Relating this experience to several knowledgeable people, said Capt. Cameron he was perturbed by their lack of interest in the subject. Some stated that this was a peculiarity of the semi-rigid rotor system, and would not occur on the fully articulated rotors of either the S-51 or the 171. Others seemed to think that friction heating at the tips of the blades should keep helicopters clear of icing troubles altogether. The lecturer thought that, given the right conditions, helicopters were just as susceptible to ice accretion as any other type of aircraft, and therefore something should be done about it.

Turning to human factors, the lecturer said that the question of pilot utilization had to be assessed with the handling qualities of any given type of helicopter, the amount of effort necessary for night and blind flight, and the navigation aids provided. Flying by day under helicopter V.F.R. conditions on routes familiar to the pilot, there was no reason why the 171 should not be flown four hours per day per pilot for fairly protracted periods. This figure was capable of being increased to five hours per day if a reliable automatic means of navigation were installed.

Touching on freight-accommodation, the lecturer remarked that the 171 was not designed for the regular carriage of bulky freight. The luggage space of less than nine cubic feet was only half of what is desirable on B.E.A. services for four passengers. On the 171s ordered by B.E.A. for scheduled passenger services, a modification had doubled the luggage space.

In summing-up, Capt. Cameron remarked that he had been purposely critical of the prototype 171 on many small points, which had since been modified to B.E.A.'s complete satisfaction. Other civil operators would naturally benefit from this work, as later production models would undoubtedly prove the excellence of the aircraft.

From an operator's point of view, the biggest stumbling-block with single-engined helicopters was the weather minima below which they were not allowed to fly. Limitations agreed for the B.E.A. Unit by the Ministry of Civil Aviation were 500ft cloud-base with a horizontal visibility of not less than 880 yd. During winter in Great Britain, it was difficult to maintain 75 per cent regularity on scheduled services, and this was not good enough. We must have twin-engined helicopters of good stability, and hence good blind-flying characteristics, in order to give the travelling public a service almost independent of weather limitations. To obtain such a service, the production of multi-engined helicopters in this country should be given super priority.

The chairman, W/C Brie, then threw the meeting open to general discussion, some notes on which we hope to print in a subsequent issue.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Fog Dispersal

THE present method of airfield fog-dispersal, Fido, is very inefficient. Experiments to reduce the cost of operation may have some degree of success, but the statistics of war-time use give about 6,000 gallons per landing. This may be somewhat reduced, and cheaper oils used, but the cost will always be high. When the system is switched off the fog usually closes in again.

Substitution of turbojets for the present pipe burners, as suggested in the letter from Mr. Patrick Johnson (*Flight*, December 19th, 1952), might be a step in the right direction, for, although convection currents are set up with Fido, greater turbulence should occur with this method.

Sufficient turbulence, if it could be induced, would by itself prevent formation of fog. Three or four years ago the National Institute of Agricultural Engineering, Silsoe, Beds., was experimenting with a helicopter rotor, revolving slowly on a vertical shaft driven, I believe, by a 10-h.p. engine. The intention was to prevent damage to fruit blossom, by producing too much turbulence for frost formation in the vicinity of an orchard.

Fog, of course, is a much larger problem, but is basically similar in that sufficient turbulence will overcome the inversion which causes the fog to persist, and will therefore disperse it.

A combination of the turbojet and rotor methods to give large "windmills" with engines at the blade tips, similar to the rotors of Westland projects W.85 and W.90, would produce both heat and turbulence. Whether vertical or horizontal mounting would produce the best results is interesting and might depend upon the thickness of the fog layer, but we are aiming at a vertical deplacement, and a suitable combination of both might produce the desired result. The amount of equipment needed to prevent formation—not merely to disperse the fog when formed—would probably be quite prohibitive. But London has over fifty foggy days per year; and although that number includes, by definition, days when the visibility falls below a range of one kilometre, considerable inconvenience is caused, and a great deal of money and a number of lives lost; intensive and even expensive preventive measures, therefore, are fully justified.

If we have a supercooled fog (which, admittedly, is not common) the simplest method of dispersal is, of course, to swing a piece of "dry ice" on the end of a string (this is similar to the technique of seeding supercooled clouds to produce rain). The possibilities of a winter occupation for ice-cream peddlers must be obvious; and under suitable conditions even the police might be issued with dry ice and string.

M. J. CATHERWOOD.

Cambridge.

Aircrew Training

I READ, with more than academic interest, the article on "Aircrew Training," by F. A. Chapman (February 13th) and I would like to put forward a few ideas I have on the subject.

The scheme I have in mind is that a fund be set up by the Treasury, the operating companies and or the aircraft industry, from which the prospective commercial pilot could *borrow* the money to enable him to get his "ticket." First he must have obtained his Private Pilots' Licence; how he gets it is his own worry.

The fund should be controlled by G.A.P.A.N. and B.A.L.P.A. as they are in the best position to know the right recruits.

The money in each case should be limited to £600, i.e. 200 hours at £3 per hour, but the flying clubs would probably give a reduced rate for a "block of hours," and also help out with the technical subjects, as at this stage the main idea is not to get a Flight Navigator's Licence, but to obtain a Commercial Licence and maybe even an Instrument Rating.

Now the pilot has become the proud holder of a brand new Commercial Pilots' Licence and is faced with the problem of getting a job and to pay back the loan, within, say, six years. There are a few jobs going which should be reserved for pilots with a limited amount of hours, and I think the only way to reserve such jobs would be to limit the salary to say, £500 p.a. I refer, of course, to joy-riding and army-co-operation flying. After a few hours' more experience the pilot could do simple charter work in V.F.R. conditions, then I.F.R. and so on.

He can then graduate to the larger aircraft as a first officer with a Group II rating and then a Group I rating, and so progress gradually up the scale, till he is flying as a senior captain on world routes on the latest types of aircraft.

Service flying and Civil flying are two different occupations, and should only combine in the event of war.

The scheme suggested by Mr. Chapman would solve one problem, that of the flying training schools about to be closed down; but to my knowledge these schools were more on Service lines than Civil and I am sure the R.A.F. knows how to look after itself. A large number of the 300 redundant instructors do not hold Commercial licences; if they have, then they will have no difficulty in getting a job, for there is a pilot-shortage . Or are they finding out there is not quite the shortage the daily Press would have us believe? Some of these instructors also knew that to be a Civil pilot means invariably living in the London area (costlier), with irregular hours and meals (resulting in stomach trouble) and being away from their families for long or short periods. I know one or two who gave me that reason for not taking a proper Civil flying job.

Wallington, Surrey. WILLIAM C. LOCKHART.

H.P. History

WITH reference to the article on the 0/100 and 0/400 by Mr. J. M. Bruce, the following notes may be of interest to your readers: (1) Most of the 0/7s used by H.P. Transport, Ltd., were allocated an H.P. number as well as the normal civil registration, i.e., G-EAAE was H.P.16; the 1st 0/7 was H.P.1 and flew on July 5th, 1919. (2) The 0/7 used in China was H.P.6. (3) The 0/7 G-EAKE was used to visit Norway. (4) The aircraft used in South Africa, at Wynberg Aerodrome, were G-IAAA and G-IAAB (also H.P.9); H.P.7 and H.P.8 were also used to advertise "Commando Brandy." (5) Some of the American-produced 0/400s were assembled in this country, at Ford Junction in Sussex, and at Shaw and Oldham in Lancashire. Ten machines had been assembled in Lancashire by November 17th, 1918.

London, N.12. DONALD C. CLAYTON.

[We take this opportunity to correct three printing errors which occurred in Mr. Bruce's article: On p. 257 "No. 61 (Naval) Sqn." should have read "No. 16 (Naval) Sqn." and "No. 125 Sqn." should have been "No. 215 Sqn."; on p. 258 "No. 21 Sqn." should have read "No. 214 Sqn."—Ed.]

T.V. Film Inaccuracies

MAY I comment on the observations of Mr. J. Austen (*Flight*, February 27th) re the authenticity of the aircraft shown "strafing" lifeboats in the *Victory at Sea* series, Episode 9, "The Magnetic North." The aircraft were, in fact, Blenheims, and the shots taken of machines passing overhead afterwards were of Ansons.

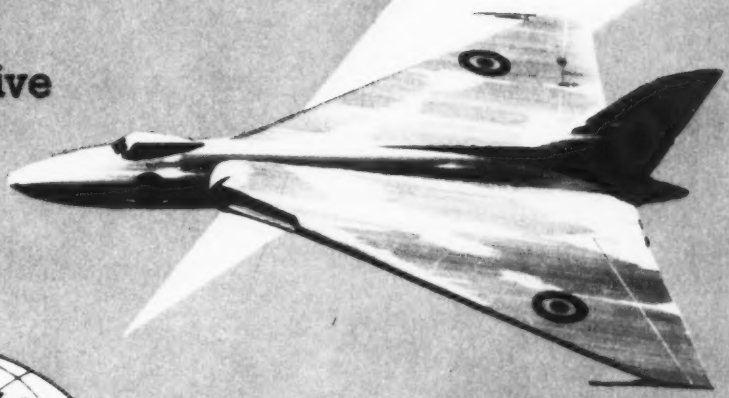
Here are some more instances of "fake" during the aforementioned series, plus a few inaccuracies: Douglas Dauntless shooting up Pearl Harbour, Beaufighters attacking U.S. marines at Guadalcanal; Thunderbolts described as Mohawks, Thunderbolts shooting down Hellcats. "S.M.79 operating within the Arctic circle" was, in fact, taken during a Mediterranean action, the same picture being shown later when the enemy were attacking a Malta convoy. There was a shot of a Wellington attacking our beach-head at Salerno, and so many more such "howlers" that it became impossible to keep check. However, press on regardless.

Fleetwood, Lancs. J. ATKINSON, 29/Q.2, R.O.C.

FORTHCOMING EVENTS

Mar. 14. British Interplanetary Society (Birmingham): "Artificial Satellites," by H. E. Ross.
Mar. 14. The Cranfield Society: A.G.M. and Dinner.
Mar. 18. Aircraft Recognition Society: Meeting: Guest Speaker, Prof. A. A. Hall, M.A., F.R.Ae.S.
Mar. 19. R.Ae.S.: Sixth Louis Bleriot Lecture: "Making Commercial Aircraft Pay," by General Guy du Merle.
Mar. 20. Institute of Navigation: "Dead Reckoning in Space," by Dr. Samuel Herrick.
Mar. 21. Air Britain: Annual General Meeting.
Mar. 21. British Interplanetary Society (Manchester): "Establishment of a Lunar Base," by R. A. Smith.
Mar. 25. R.Ae.S. Graduates' and Students' Section: "Convertible Aircraft," by J. Shapiro, Dipl. Ing., A.F.R.Ae.S.
Mar.24-26. Institute of Metals: Annual General Meeting and (Mar. 25) All-day Symposium on "Control of Quality in the Production of Wrought Non-ferrous Metals."
Mar. 27. R.Ae.S.: Full-day Discussion on "Fatigue".
Mar.27-31. ASLIB Aeronautical Information Group: 1953 Conference, Cranfield.
Mar. 31. R.Ae.S. Section Lecture: "Experimental Work on Boundary-layer Flow," by W. E. Gray.
Mar. 31. R.Ae.C.: Film Show.
Apr. 11. British Interplanetary Society (Manchester): Conversazione and Film Show.
Apr. 15. Aircraft Recognition Society: Annual General Meeting.
Apr. 18. British Interplanetary Society: Film Show.
Apr. 22. R.Ae.S. Graduates' and Students' Section: "Accident Investigation," by H. Caplan, D.C.Ae., Grad.R.Ae.S.

What makes the **Avro Vulcan** the world's most effective bomber?



The answer lies in its Delta configuration which provides:

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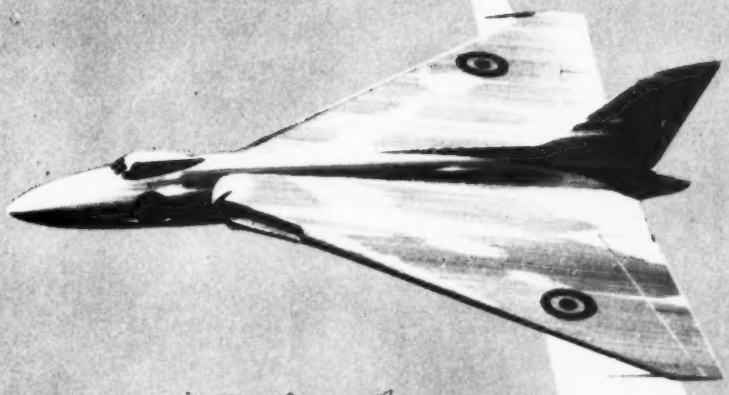
2. **Thin wings and high sweep back,** yet large **internal volume for** stowage of load **and fuel.**
3. **Low** wing-loading for high **altitudes.**
4. **Unrivalled** manoeuvrability.
5. **Safe and simple** landings without **the need of complicated** high **lift devices.**

The Vulcan is the result of three years' exhaustive flight testing on the Avro 707 Deltas. Now in super-priority production for the R.A.F.



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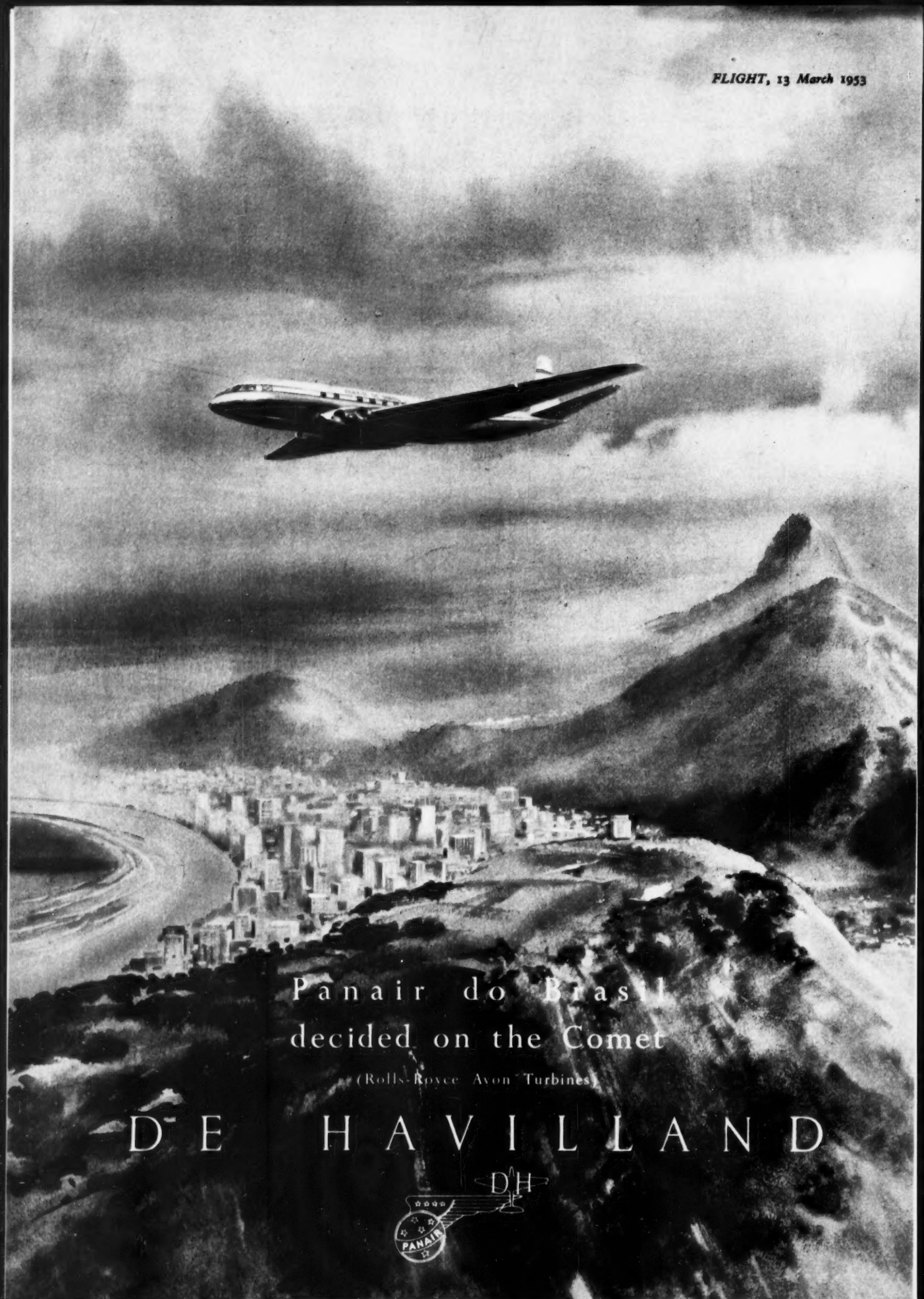

Panair do Brasil
decided on the Comet
(Rolls-Royce Avon Turbines)
DE HAVILLAND
DH
PANAIR

AIRCRAFT INTELLIGENCE

Auster's Ambulance/Freighter (top) is now flying with a new tail. The last "figure seven" in the serial number is actually a zipper in the fabric. Below it is the projectile-like S.O.9000 Trident, which has been developed from the Espadon. Both types are discussed on this page.

Great Britain

Ambulance/Freighter. Recent modifications to this aircraft are shown in the photograph above. The new fin and rudder, of increased area, projects down into the slipstream, so improving directional stability at low speeds. This, combined with a slight offset of the engine thrust-line, has so improved directional control during taxying and take-off that the mechanical tailwheel steering has been removed.

*Vampire T.*11. Yet another modification has now been incorporated on this aircraft, in addition to those listed on this page two weeks ago. Aircraft WZ 505 is now flying with large dorsal fin extensions rather similar to those fitted to the Vampire N.F. 10. At the same time, production is progressing on the Sea Vampire T.22.

*Swift F.*1. We have it on good authority that previous aerodynamic troubles have now been overcome and that more than one Swift has probably gone sonic. If so, it is a happy coincidence that Gen. Albert Boyd, the U.S.A.F. evaluation officer for "off-shore" NATO purchases, is back in this country.

France

S.O.9000 Trident. Illustrated left, below, is the prototype of the first European aircraft designed for level-flight speeds exceeding Mach 1. Main features of the type are evident, including: heavily reinforced canopy; small wing with about 30 deg sweep; curious variable-incidence tailplane with anhedral; no fuselage intakes, denoting tail rockets; and tip-mounted engines. These latter may be turbojets, but Leduc ramjets appear more likely. First flight was on March 2nd at Melun-Villaroche, but no supersonic attempts are likely for several months.

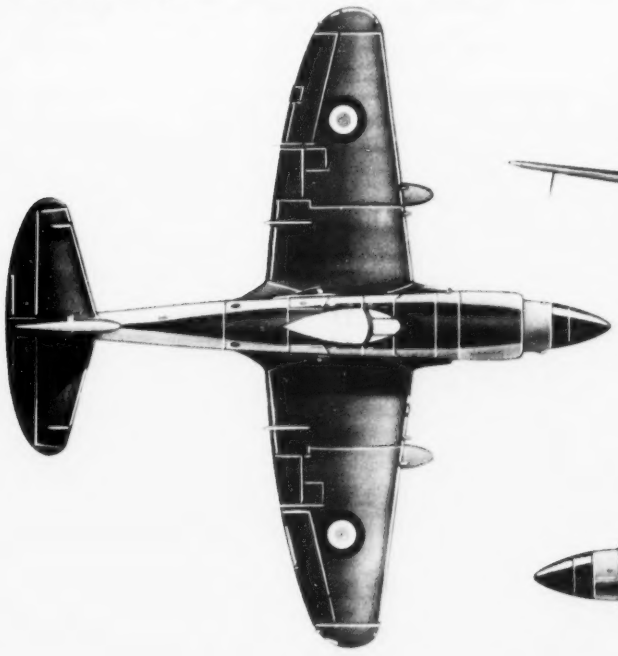
United States

Chase C-123B. After some years, this assault transport is at last in production, both by Chase at Trenton, and Kaiser-Frazer at Willow Run. A high-wing aircraft powered by two Double Wasps, the production version features a tall, squared-off tail unit.

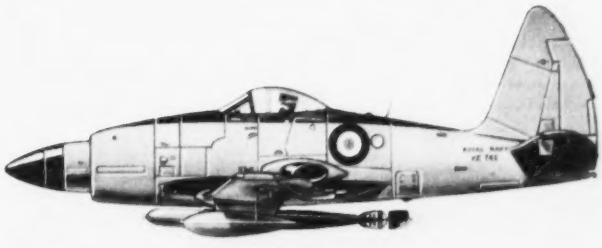
Douglas Jet Transport. According to an unofficial, but reliable, source, the forthcoming Douglas turbojet transport will make a breakaway from the normal American swept wing—the new shape may, in fact, be a crescent. Even more significant is a hint that the engines will be made by Rolls-Royce.

Grummann S2F-1. As yet unnamed, this aircraft is the first search *and* strike aircraft ever built in America. Previously, two aircraft were needed, working as a "hunter-killer" team. The S2F (illustrated on page 6 of our issue of January 2nd) has a crew of two, side-by-side, in the nose. A total offensive load of up to 6,000 lb is possible, including rockets mounted on wing racks outboard of the engines. The large early-warning search-radar installation is in the nose and a smaller strike-radar scanner is carried in a fairing on the starboard wing.

Lockheed C-130. Dimensions of this four-turboprop transport are: span, 132ft; length, 95ft. In spite of the fact that the entire rear fuselage forms a giant door—for air-dropping troops and supplies, and for loading vehicles—the fuselage is pressurized throughout. But the Allison T-38 engine is not yet considered suitable for Service use. The C-130 was illustrated on page 245 of our issue of February 27th.



WESTLAND WYVERN S.4
(Armstrong Siddeley Python)
Span 44ft
Length 42ft 3in



Briefing of five Varsity aircrews and student navigators in the operations room at Thorney Island.

WEEK-END IN AFRICA

A Navigation-training Trip in a Varsity

By JOHN YOXALL

First pilot, F/L. W. W. Lee.

Second pilot, F/S. J. H. Catlin.

W/C. D. I. McMonnies and S/L. Nixon, respectively Wing Commander Flying and O.C. Varsity Squadron at Thorney Island.

THE Royal Air Force never thinks parochially—unless, of course, one considers the whole globe as its parish. The world-wide end-of-course flights from the R.A.F. College of Flying at Manby are well known; but now even student navigators, at the end of their training, get a flight to Africa as a reward for hard work.

These flights usually take place over a week-end, an arrangement which has the double advantage of giving the student navigators and the staff aircrews a day or two in pleasantly warm and novel surroundings while keeping the Vickers-Armstrongs Varsities out of routine service for only the minimum time.

Recently the writer was invited to accompany ten student navigators from No. 98 Course, No. 2 Air Navigation School, on one of these trips; it was from Thorney Island, Hampshire, where the school is based, to Idris in the new United Kingdom of Libya. Idris is better known, perhaps, by its old name, Castel Benito, the military and civil airfield for Tripoli, North Africa. Five Varsities were detailed for the journey.

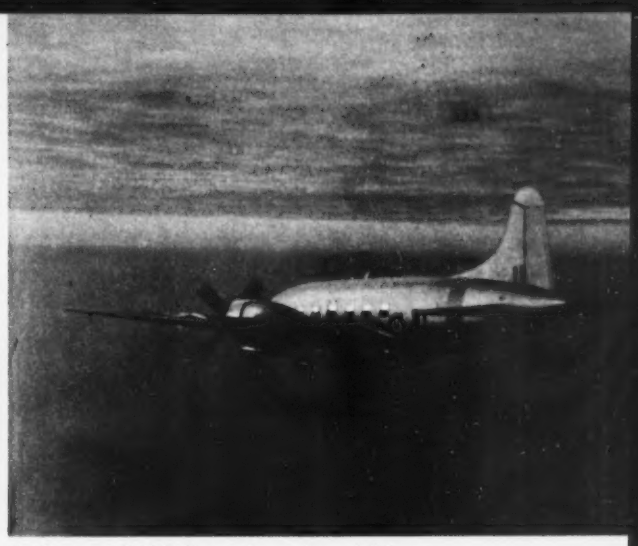
Emergency drills having been practised, the 40 aircrew and students foregathered on Thursday afternoon in the operations room at Thorney Island to be briefed for the 1,200-mile journey.

"Met." promised fog over France, fine weather over the Mediterranean and clear skies at Idris. Safety height was given as 7,000ft over France, rising to 9,000ft over the central *massif*. As far as the Riviera the journey was intended to simulate a Bomber Command operational flight and the crossing of the Mediterranean to reproduce a Coastal Command operation. For this latter practice a height of 2,000ft was stipulated, climbing once more to cross the danger area near Tunis. As far as the South of France the aircraft were to be in communication with Gloucester and from then onwards to report regularly to Malta.

A very early call—0030 hr—on Friday morning brought 40 yawning aircrew to the airmen's mess for the usual aircrew meal of egg and chips. Final briefing followed at 0200 and there was then something of a hiatus until take-off at 0430. For a training aircraft the Varsity has a very long range but, even with 11 hours' fuel on board—as had these five in readiness for the journey to Africa—the take-off run lasted only about 15 seconds from fully opening the throttles of the Hercules.

What strikes one most of all about the Varsity is its roominess. Even when encumbered with flotation jacket and parachute harness it is possible to move between the various aircrew stations without difficulty. A rope thoughtfully provided along the fuselage wall makes walking to and fro easy,

The landing at Idris, showing the excellent view obtained by both pilots.



Dawn over southern France—as seen through the windscreen of Varsity F-Fox. In the grey early light Fox sneaks up alongside L-Love.

Master signaller R. Colville.

Staff navigator, S/L. R. G. Price.

Student navigators, A.P/Os. W. K. M. Bawden and J. S. Boyd.

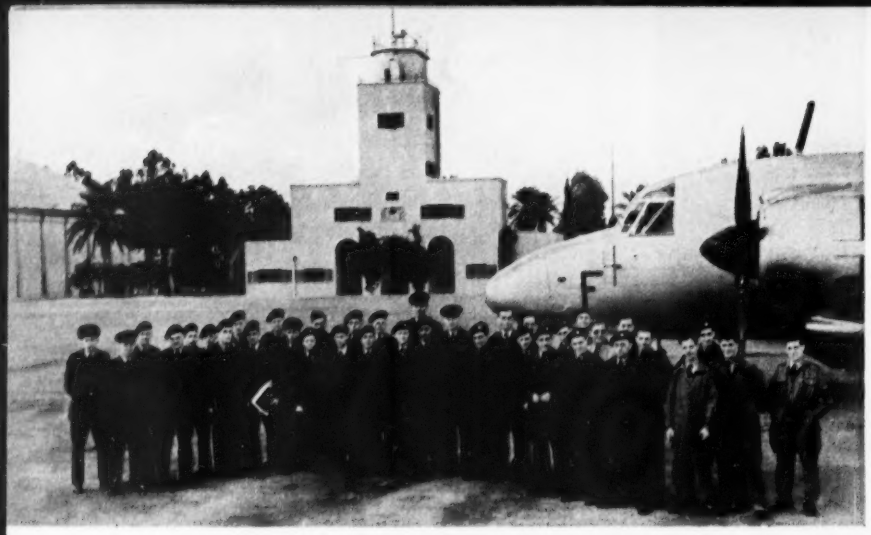
even under bumpy conditions. From front to rear the crew stations are: first and second pilot, two signallers, staff navigator (whose seat is also the astrodome platform), and the two student navigators. Any ground crew carried make themselves comfortable on the wheel and engine covers stowed in the rear of the cabin, and on this particular trip one spare seat in each aircraft was available because no second signallers were carried. With the exception of the pilots' seats, of course, all the chairs are rearward-facing. Stressed to stand 26 g, they are designed with vertical back rests and head-pads; but unless a back-pack parachute is worn—and these were not available for the journey—they must be considered more in the light of efficiency than of comfort.

The Varsity climbs well and it seemed only just after take-off and a turn that we were on course, 158 deg, over

ILLUSTRATED BY "FLIGHT" PHOTOGRAPHS

The staff navigator overwatches his two students. S/L. R. G. Price, in addition to being staff navigator, was also officer commanding the detachment.

Ready to return. The scene on the tarmac at Idris while daily inspections were in progress on Sunday.



Against a background of date palms, station headquarters and Varsity F-Fox: the aircrews and student navigators at Idris airfield.

D.I. at Idris. The hinged cowlings of the Bristol Hercules make the engines easily accessible.

WEEK-END IN AFRICA . . .

base at 4,000ft and still climbing. At 5,500ft the pilot levelled off and throttled right back for economy's sake to 1,750 r.p.m. with 140 kt indicated.

On board was S/L. R. G. Price, one of the senior navigation instructors at the school, and from his station immediately behind the student navigators he could keep a close check on their work. In this he was helped by the Varsity's intercommunication system, which allows for switching either to "operational" or "training." In the latter position only the students can be heard; each crew station on the aircraft has this provision.

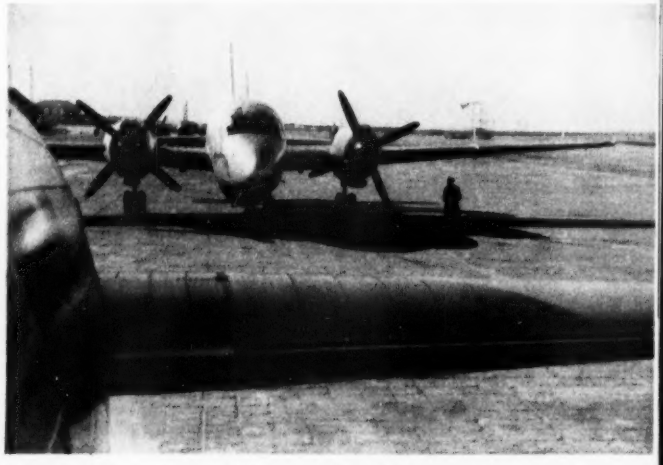
The French coast was crossed 35 minutes after leaving Thorney Island and Paris appeared as a cluster of fairy lights in a cloud gap at 0545 hr. As we passed the French capital the first lightening of the eastern horizon showed dawn to be on its way, and soon came that period when the phosphorescent markings on the instruments fight a losing battle with the mounting daylight, neither the loser nor the winner being able to give a bold outline.

One of the regulations covering Service flights over France is that all aircraft must report to local control every 30 minutes. This advice is given over the R/T. in English. On asking for a fix at 0640 hr we were given our position as 37 miles from Le Puy, where the central *massif* of France begins, and we climbed to the safety height of 9,000ft. Here slight icing was experienced, mostly on the leading edges, windscreen, aerials and air intakes.

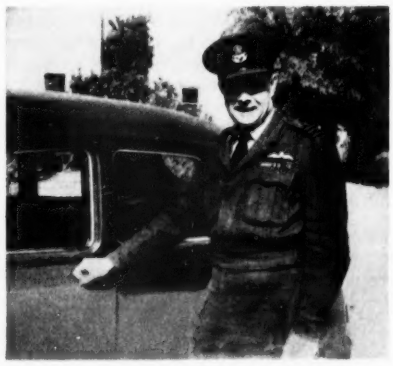
At 0700 hr a golden glow in the east presaged good weather, the snow-covered High Alps appearing almost as if on fire. More mundane checks at the same time showed 750 gallons as the quantity of fuel left, and an expectation of crossing the Cote d'Azur some thirty minutes later. This proved accurate to within five minutes and, as the Mediterranean was reached, we sighted another of our Varsities, which had started two minutes after us. As this was a navigational exercise, we did not stay in company.

Over the Mediterranean the top layer of cloud disappeared —as forecast by the meteorological officer at Thorney—and the staff and student navigators were able to perform with the sextant in the astrodome. The signaller forsook Gloucester and contacted Malta and, as the pilot lost height to 2,000ft, as laid down in the briefing—for we were no longer "Bomber Command" but had changed to "Coastal Command"—the icing vanished in the warmer air of the lower levels.

After 30 minutes flying over the sea we ran into some fairly hefty cumulus clouds, the attendant disturbed air making "George" work all the harder, but our undeviating progress served only the more to emphasize what a wonderful piece of mechanism is a modern aircraft. Later, when the cloud bank had been passed and calmer air found, the second pilot took over and amused himself by getting such perfect throttle, airscrew and trim settings that "George" had nothing to do. By the time this had been achieved



A glimpse from the door of F-Fox during the halt at Istres, Marseilles.



W/C. W. T. Dennis, Station Commander at Idris.

the autopilot was giving only a very occasional "kick."

By 0930 hr we were over Sardinia and starting on the final 420 miles of the journey. Fuel consumption had fallen from 94 gal/hr, for the first half-hour period, to 70 gal/hr. The warm-air supply for which we had been so grateful earlier on was now switched over to "cool," to keep the cabin from overheating—an effect in the Varsity which is quite pronounced anywhere aft of the pilots' seats.

As the African coast was approached the aircraft was made to climb at 2,000 ft/min in order to clear the danger areas at Bizerta and Tunis, which were on our direct path. The Idris beacon was picked up at 72 miles and finally a thistledown landing was achieved at 1240 hr G.M.T.

All five Varsities arrived on time and none reported major

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WEEK-END IN AFRICA . . .

unserviceabilities. Shell were quickly on the scene to refuel and, with the exception of the D.I.s to be performed on Sunday in preparation for the return journey the crews and students were free to enjoy a week-end of warm sunshine and interest, including a visit to Tripoli, 22 km distant.

The return journey, early on Monday, was presaged by reports of bad weather over Britain. Low cloud at 600ft was spoken of, with diversions either to Manston or East Anglia. It was decided to go into Istres (Marseilles) to top up with fuel, though the pilot was a little worried at the prospect: one of our tyres had developed a nasty cut, and he was aware of the existence of a long P.S.P. taxi track at Istres. The delay in starting, however, was due to the fact that Istres—five-and-a-half hours distant—does not open until 0700 hr.

On these practice trips an attempt is made to do half the journey in darkness and half in daylight. In this case, the change of schedule made it impossible to adhere to such a programme. And so, under a brilliant moon sailing in an indigo sky, and in air that was cool, but far removed from the English winter variety, we talked and smoked until it was time to go aboard.

We in Fox were first away at 0210 G.M.T., climbing to 6,000ft. Idris control wished us good morning just as the coast was reached. Crews were now feeling the effect of a strenuous week-end, and the tea served from a Thermos flask was a welcome aid to keeping awake as we climbed once more to cross Tunis.

Over the Mediterranean the sun came up as a great golden orb, so different from the first grey light which had ushered in the dawn on the way out. Our E.T.A. at Istres was timed for shortly after 0700 hr but we arrived slightly earlier, at 0655, and had to make circuits until a voice from the control tower gave us the O.K. to land at 0707. The slit tyre gave no trouble, neither did it get any worse. A crew bus was waiting to take us to the mess, where the usual fried egg and chips transit meal was ready to be served in return for a very bi-lingual chit—"Bon Pour One B'Fast."

Take-off for the last leg was slightly delayed this time owing to a faulty switch in Nan; but the electrician we had brought with us in Fox was able to fix things temporarily and we were soon airborne and passing over Montelimar, the nougat town. As we flew up the Rhône valley the scene was quite exquisite, with the Alps to the right and the Auvergne mountains to the left, both snow-covered and glistening in the brilliant sunshine.

From Clermont-Ferrand northwards the French landscape is uninteresting and we had just to possess ourselves in patience as we droned towards the French coast. It was crossed at Le Havre, where the pilot coarsened pitch and throttled back a trifle for the final let-down through the clouds for Thorney Island. The first glimpse of Britain showed that it had not changed its colour in our absence; it was still grey . . .

So ended a pleasant, if strenuous, week-end. For the student navigators it was in the nature of a prize for some very hard work at No. 2 Air Navigation School.

Nine months previously they had come from the Initial Training Wing to No. 2 A.N.S. to be taught air navigation and trained to be officers. Their rank was acting pilot officer with their commissions subject to confirmation at the end of a satisfactory course.

On the technical side the syllabus at No. 2 A.N.S. includes dead reckoning, astro-navigation, compasses, maps and charts, radio, radar, meteorology, weapons, and instruments. For officer-training the subjects are: administration and organization, management of men, current affairs and the other Services. The students live in the officers' mess and are taught how to conduct themselves both by example and precept.

Flying training during the course includes 193 hours in the air, of which 103 in the basic stage are on Valettas and Ansons. The Valettas are flying classrooms accommodating 10 students at a time. The remaining 90 hours of the advanced stage, are mostly on Varsities. A further division in the flying time is that of night and day. Approximately 64 hours of the basic stage and 31 hours of the advanced stage are by day and the remainder by night.

Just before the end of the course—No. 98 Course graduates today, March 13th—the ten best navigators are selected for one of these long overseas flights in order that they may practice procedures and employ aids whilst flying over foreign countries. The policy is that eventually all the students that qualify will be rewarded with one of these overseas trips, but at the moment it is possible for only about half of them to go. More staff aircrews and aircraft are needed before any improvement can be shown.

FLIGHT REFUELLING—AMERICAN AND BRITISH

RECENTLY we reported the news of an agreement between Flight Refuelling, Ltd., and certain American interests, whereby Flight Refuelling, Inc., of Danbury, Conn., becomes a partner rather than a subsidiary of the Tarrant Rushton, Dorset, concern. Relating the events leading up to this development, the British company has issued a most informative statement.

In 1948 (it says) the U.S.A.F. placed its first contract with Flight Refuelling, Ltd., for the supply of a large quantity of equipment for the looped-hose system of refuelling in order to extend the range of B-29 bombers. To look after the parent company's growing interests in the U.S.A. a subsidiary called Flight Refuelling Inc. was formed at Danbury, Conn. in 1948.

Urgent American demand for refuelling single-seat fighters came early in 1949, and Flight Refuelling, Ltd., designed and produced the simplified probe-and-drogue system in four months. The U.S.A.F. ordered probe-and-drogue experimental equipment for test in September, 1949. Its first publicly announced use broke into the news when Col. David Schilling, of the U.S.A.F., flew a Thunderjet non-stop from Manston, Kent, to Bridgeport, Conn., in the autumn of 1950.

Since the outbreak of the war in Korea some 2,000 refuelling contacts by probe and drogue have been reported from that theatre, and the tactical importance of flight refuelling has been amply proved under combat conditions. In 1951 Col. Harry Dorris made the longest known combat strike, in a probe-equipped F-80. Starting from a Japanese base, he made five attacks on widely separated Communist targets and then returned to Japan. To enable him to do so, he made seven refuelling contacts with a B-29 tanker while maintaining radio silence. His flight lasted over 14 hours. Later, two U.S.A.F. F-84 fighters fitted with probes were refuelled in flight whilst they maintained air cover, pending rescue, over two other pilots who had ditched their battle-damaged F-84s in Korean waters.

In 1952 the U.S.N. adopted this British system of flight refuelling for Grumman Panther and McDonnell Banshee fighters, using the North American Savage bomber as a quickly convertible carrier-borne tanker. Other reported developments concern naval flying-boat tankers with multiple refuelling points.

Since 1949 various types of flight-refuelling equipment have been supplied to the U.S. air Services, and the A-12 hose reel unit produced by the Danbury subsidiary for drogue tankers is reported in current supply to the U.S.A.F. and the U.S.N. Bureau of Aeronautics. U.S. aircraft known to have been fitted with probes include the F-80, F-84, F-86, F9F, F2H, B-29 and (reportedly) the B-47. Tankers with drogue equipment include the KC-97, B-29, the AJ-1 and AJ-2, possibly the R3Y-1 flying-boat and reportedly the B-47.

With a vast expansion of American demand for the probe-and-drogue refuelling equipment imminent, the American branch of Flight Refuelling, Ltd., has moved forward into American partnership and is no longer just a subsidiary of the parent firm. Mr. Laurence Rockefeller has bought 32 per cent of the shares, Reaction Motors 24 per cent, and associated financial interests 4 per cent. Flight Refuelling, Ltd., retains 40 per cent interest in the American company and is still the largest single shareholder. Sir Alan Cobham and Mr. Christopher Tonge, representing the British company, sit on the board. Complete collaboration and exchange of information between the British and American companies is a feature of the new agreement between them.

On both sides of the Atlantic (the statement concludes) the Flight Refuelling design staffs are now engaged on long-term development programmes in which it is expected that the British as well as the U.S. Government will be interested. British enterprise is well in the lead in the invention and development of Flight Refuelling systems, but recent reports show that the U.S.A.F. and U.S.N. are at least two years ahead of the R.A.F. and Royal Navy in plans for the practical application of airborne refuelling equipment to high-speed, high-altitude jet fighters and bombers.

INSTRUCTORS FOR ETHIOPIA

AN advertisement has appeared recently in *Flight* inviting applications for the post of assistant technical instructor in airframes, engines and instruments required by the Imperial Ethiopian Air Force. On February 20th a London newspaper stated that five British instructors are going to Abyssinia this spring and, after quoting the terms of their appointment, added: "Features of their lives in the capital will be no sanitation, no running water, and no lighting." We are informed by the Ethiopian Embassy that this statement is untrue. The facts, says the Embassy, are that the instructors and their families will occupy bungalows at the Air Force Training School 27 miles from Addis Ababa, and that electric light and power, piped water supply and satisfactory modern sanitation are provided.

THE AERONAUTICAL BOOKSHELF

"History of Marine Corps Aviation in World War II," by Robert Sherrod. Combat Forces Press, 1115 Seventeenth Street, Washington 6, D.C., U.S.A. Illustrated. Price $6.50.

IT is rare that a military history is completely satisfying. Usually there are too many dry technical details and too few stories of individual heroism; or, alternatively, too much blood and thunder and too little serious reference data. Sometimes there are insufficient maps to follow the course of battle, or the author assumes that his readers will know the meaning of abbreviations like "VMTB-143," "AirFMFPac," "LFASCU," and all the other mumbo-jumbo inseparable from modern, sophisticated warfare.

For that reason we commend this book to would-be historians, as well as to anybody else who wants a first-class, accurate, readable history of a fine fighting service. The achievements of U.S. Marine shock troops in the bloody landings at Tarawa, Okinawa and a score of other beach-heads in the Pacific island hopping campaign are familiar even to British readers. Less well known are the achievements of the 1 per cent of the U.S. Armed Forces who served in Marine Corps Aviation. Yet these 140,000 men (with the help of about 8,000 women Marines) destroyed 2,355 enemy aircraft, suffered 3,649 casualties, won 11 Congressional Medals of Honour and pioneered the modern concept of close support for ground forces—a duty they have since resumed with conspicuous success in Korea, using later versions of the same Corsair fighters they flew in 1943-5.

For the first 18 months of war, the Marines had nothing so good as a Corsair. At the start of the battle for Guadalcanal, the air commander was able to count on a total of 291 aircraft, mostly obsolete, including 12 ancient Singapores and Vincents of the R.N.Z.A.F. and 38 Airacobras; the last named were extremely unpopular, but useful because they could carry depth-charges, highly effective against land targets. The odds were lengthened by the fact that many Marine pilots had only 275 hours' flying time, mostly on SNJ Harvard trainers, while the Japs at that period averaged 800 hours apiece. To their credit, the Americans fought so aggressively that by the time Guadalcanal was secured there were few top-rank enemy pilots left.

One consequence was the Kamikaze, and Mr. Sherrod gives a terrifying picture of the effectiveness and scale of Jap suicide attacks. During the Philippines campaign 26.8 per cent of the Kamikazes found their shipping targets; at Okinawa 14.7 per cent of them hit 279 ships, inflicting terrible damage and casualties; and the Japanese had 10,700 Kamikazes and 18,600 pilots ready to slam the Allied invasion force which they expected to see off Kyushu in October or November, 1945.

There are many more features of this book that are worthy of note, including brief combat histories of every Marine Corps aviation unit, first-class glossaries, index, operational statistics, designations of U.S.N., U.S.M.C., U.S.A.F. and Jap aircraft, 144 excellent photographs, 45 maps and diagrams—and the incredible story of Operation X-Ray. Object of this was to set alight the paper cities of Japan by releasing, from aircraft, squadrons of bats, each carrying a small incendiary capsule. Unfortunately the bats' mating habits and poor airworthiness with overload provided insuperable problems. In one test with 25 bats, for example, 15 spun in, five flew away, one jettisoned his bombload, three were able to fly for only one minute, leaving just one which made a safe (?) landing. It is one of the few stories of failure in a 496-page record of initiative, aggressiveness and high courage.

"Sight Reduction Tables for Air Navigation." (AP 3270, Vol. 1) Her Majesty's Stationery Office, London. Price £1 1s. 0d.

THIS is the first of three volumes forming the British edition of the U.S.N. Hydrographic Office Publication H.O. 249, which has been prepared jointly by the U.S. Nautical Almanac Office and H.M. Nautical Almanac Office. Both editions have been reproduced photographically from the same material. The present volume contains tabulations of altitude and azimuth for all latitudes for six stars selected for each range of hour angle, designed for use with the jointly-produced *Air Almanac* in the reduction of sights of the Sun, Moon and planets. The three volumes will together eventually replace the *Astronomical Navigation Tables* (AP 1618).

BOOKS RECEIVED

Industrial Brazing, by H. R. Brooker and E. V. Beatson, B.Sc. (Eng.), A.M.I.E.E. Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 35s. The first full-length, authoritative study of brazing as a process in metal-fabrication, this book will prove of equal value to those engaged in operating industrial brazing processes and those responsible for the design of brazed assemblies.

Handbook of Aeronautics, No. 1, 4th Edition: Structural Principles and Data. Sir Isaac Pitman & Sons, Ltd., Pitman House, Parker Street, Kingsway, London, W.C.2. Price 45s.

Time Enough to Live, by Dan Brennan. Martin Secker and Warburg, Ltd., 7 John Street, Bloomsbury, W.C.1. Price 10s 6d.

Aeronautics at the Mid-Century, by Jerome C. Hunsaker. Yale University Press. London: Geoffrey Cumberlege, Oxford University Press, Amen House, Warwick Square, E.C.4. Price 20s.

Teach Yourself Astronomy, by David S. Evans. English Universities Press, Ltd., St. Paul's House, Warwick Square, London, E.C.4. Price 6s.

Model Aeroplanes, by Norman G. Taylor. Cassell & Co., Ltd., 37/38 St. Andrew's Hill, London, E.C.4. Price 4s 6d.

Electricity Tariff Handbook, compiled for *Electrical Review*, with the advice and assistance of V. A. H. Clements, M.I.E.E. Distributed by Iliffe and Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Mr. Clements is the assistant commercial manager of the British Electricity Authority, and this book gives full details of the standard tariffs in operation in England, Scotland and Wales. Many additional data are also provided.

ORDER BOOK

Post-war Production of British Commercial Aircraft

THERE has been considerable—and increasing—talk during the past few years of the progress made in the manufacture of commercial aircraft in the United Kingdom, but not everyone has an accurate idea of the large number of firm orders that have already been placed. The Table on the opposite page shows the position at the present time—though no reference is made therein to the very appreciable number of inquiries about our latest turbo-prop and jet airliners that are also being discussed.

The grand total of firm aircraft orders is just under 900—the Dove leading the field with around 400 aircraft already built, followed by the Viking at 163 and the Freighter at 79 (plus 109 military variants). Announced figures for the "big three"—Comet, Viscount and Britannia are 49, 78 and 30, but it is known that orders for about 100 Series 2 and 3 Comets are currently under discussion, and that interest is being shown in the Viscount and Britannia by many different operators. Both de Havillands and Vickers have laid down large "American size" production lines for their aircraft. Present Viscount production is at Weybridge, but all the aircraft scheduled to be built there have been started, and the new line at Hurn will commence productivity next year—eventually turning out 100 aircraft per annum. Comets are already made at Hatfield and—by Shorts—at Belfast, whilst a further line is expected to be laid down at Chester. Bristols, too, have big plans for the Britannia. B.O.A.C.'s far-sighted initial order for 25 aircraft enabled them to plan a line at Filton which will turn out two aircraft each month, and a similar line is to be laid down by another manufacturer in the North of England. Canadair may also build a military version of the aircraft. A small additional item is that B.E.A. and P.A.W.A. hold options for 12 Viscount 800s and seven Series 3 Comets, respectively, over and above the firm orders they have already placed.

All in all, therefore, the picture is by no means unpleasing—though the sooner more of the inquiries become firm orders the better it will be. In this connection the proposals of the Air League referred to last week call for close consideration. Undoubtedly means must be found to expand rapidly this country's air transport resources.

NOTES

Bristol 171 : Baggage capacity is 20 cu ft. Decca Navigator and Flight Log are fitted, also side exhaust-system. Several military versions are in service.

Short Sealand: Two aircraft operated by a Norwegian company have had their undercarriages removed and function solely as flying-boats. This does not convert them into Mk 2 Sealands, as in this project undercarriage structure would also be eliminated. Later Sealands have the more powerful Gipsy Queen 70-4 engines.

Percival Prince: Discussions are in progress with A.R.B. regarding the certification of the Pembroke—the R.A.F. variant of the Prince with new wing and greater power and all-up weight.

BRITAIN'S CIVIL-AIRCRAFT ORDERS IN DETAIL

Aircraft Type	Power Units and Output of Each	A.u.w. and Basic Empty Weight (lb)	Total Orders	Present Operators	Max. Stage-length (statute miles) with Given Payload or Fuel Load	Seats	Total Deliveries by 1.4.53	Quoted Delivery Date as at 1.4.53	Approx. Cost (£)
Bristol:—									
Britannia Series 100	4 Proteus 3 turboprops 3,320 b.h.p., 1,200 lb thrust	140,000 and 72,000	B.O.A.C 25	—	3,700 (25,000 lb) 5,750 (9,125 lb)	92	—	—	—
Britannia Freighter Series 200	As above	155,000 and 72,700	B.O.A.C. 5	—	Max. payload 43,000 lb	—	—	—	800,000
Type 170 Mk 21	2 Hercules 672 1,690 b.h.p.	40,000 and 25,845	67 Mk 21 and Mk 31 delivered by 1.4.53	A.N.A., Avacion y Comercio, Silver City, Saudi Arabian Govt., Air Vietnam, S.C.A.L., W.A.A.	—	32-48	67*	10-12 months	85,000
Mk 31	2 Hercules 734 1,980 b.h.p.	44,000 and 26,910	plus Iberia 3 T.C.A. 3	Straits Air Freight Service, Iberia, Associated Airways, T.C.A., Aer Lingus, Aviation Traders, Av. y Comercio.	300 (14,200 lb) or 1,600 (8,000 lb)	32-48		10-12 months	85,000
Mk 32	As above	44,000 (a.u.w.)	Silver City 6	—	—	—	—	—	85,000
Type 171 Mk 3A	1 Leonides 525-545 b.h.p.	5,300 and 3,943	B.E.A. 12	B.E.A.	265	5, inc. pilot	1	6-9 months	35,000
de Havilland:—									
(Airspeed) Ambassador	2 Centaurus 661 2,625 b.h.p.	52,500 and 36,650	B.E.A. 20	B.E.A.	1,220	40-47	20	—	225,000
Comet Series 1 and 1A	4 Ghost 50 5,000 lb thrust	Series 1 105,000 (a.u.w.) Series 1A 115,000 (a.u.w.)	Series 1: M.o.S., 2; B.O.A.C., 9. Series 1A: C.P.A.,2; U.A.T. 3; R.C.A.F., 2; Air France, 3. Total, 21.	B.O.A.C., U.A.T., C.P.A.	1,510 (Series 1) 1,785 (Series 1A)	36-44	16 (min)	No further production	450 000
Comet Series 2	4 Avon 6,500 lb thrust	120,000 (a.u.w.)	B.C.P.A., 3; B.O.A.C., 12; J.A.L. 2; L.A.V., 2; M.o.S., 1; Panair do Brasil, 4. Total, 24.	—	2,200	44	—	1955-56	500,000
Comet Series 3	4 Avon 9,000 lb thrust	145,000 (a.u.w.)	P.A.W.A., 3; M.o.S., 1. Total, 4.†	—	2,600 (58-seater) 2,400 (76-seater)	58-76	—	1958	—
Doves Series 5 and 6	2 Gipsy Queen 70 Mk 2 380 b.h.p.	8,800 and 5,760	Nearly 400.	Very numerous.	1,000	Series 5, 8-11 Series 6, 5	Nearly 400	June, 1953	22,000
Heron	4 Gipsy Queen 30 Mk 2 250 b.h.p.	12,500 and 7,985	N.Z.N.A.C., 1; Braathens, 2; T.A.S., 2; Butler, 2; U.A.T., 9; Garuda, 14; Jersey, 1; P.L.U.N.A., 4; J.A.L., 3. Total, 38.	N.Z.N.A.C., Braathens, T.A.S., U.A.T.	1,000	14-17	7 (plus 2 prototypes)	March, 1954	37,500
Handley Page (Reading):—									
Marathon Mk 1A	4 Gipsy Queen 70-4 340 b.h.p.	18,250 and 12,356 (W.A.A.) 12,586 (U.B.A.)	W.A.A., 6; U.B.A., 3. Total, 9.	W.A.A., U.B.A.	710 (356 gal) 880 (416 gal)	18	9	—	—
Percival:—									
Prince III and IV	2 Leonides 540/560 b.h.p.	11,000 (or 11,500—A.R.B. approval awaited) and 7,590	—	Various companies in S. Africa, Switzerland, Thailand, Brazil, Australia and Great Britain.	965	8, 10, 12	25	9 months	35,000
Short Bros. and Harland:—									
Sealand Amphibian Mk 1	2 Gipsy Queen 70 340 b.h.p.	9,100 and 7,065	Various o'sea orders, inc. 10 for Indian Navy. Total, 23.	Various operators.	695	5-8	—	—	—
Vickers-Armstrongs:—									
Viking	2 Hercules 634 or 635 1,690 b.h.p.	34,000 and 23,000	163	Numerous, notably B.E.A.	1,700 (750 gal) 1,130 (500 gal)	24-38	163	—	—
Viscount 700 Series	4 Dart RDa 3 1,400 b.h.p., 365 lb thrust	58,500 and 33,075	B.E.A., 24; Air France, 12; Aer Lingus, 4; T.A.A.,6; T.C.A. 15; B.W.I.A., 3. Total, 66.	B.E.A. (April).	1,550 (8,400 lb)	48-62	—	Air France, 1953; Aer Lingus, 1954; T.A.A., 1954; T.C.A., Sept.-April, 1955	235,000
Viscount 800 Series	4 Dart RDa 5 1,540 b.h.p., 400 lb thrust	65,000 and 39,112	B.E.A. 12	—	1,100 (10,300 lb)	66-82	—	Oct., 1955	270,000
V.C.7	4 Conway by-pass turbojets	—	—	—	—	100-150	—	—	—

* The above figure refers to civil 170s; 109 military versions of the aircraft are additionally on order for, or in service with, a number of overseas governments.

† B.O.A.C. have an undisclosed number of Comet 3s on order.

FUTURE METHODS of CONSTRUCTION

H. J. Pollard's Lecture to the Royal Aeronautical Society

ON Thursday, February 26th, Mr. H. J. Pollard, Wh.Ex., F.R.Ae.S., divisional director (aircraft), Bristol Aeroplane Co., Ltd., read a paper to the Royal Aeronautical Society entitled *New Materials and Methods for Aircraft Construction.* His remarks constituted an admirable review of prospects for the near future, and a digest of his principal points follows.

Mr. Pollard began by recalling a lecture he had read to the Society in 1934, when he discussed the then new aluminium alloys. His intention on the present occasion was to consider new materials which might in the future take the place of aluminium alloy for certain ranges of primary aircraft structure. The table [given below] showed the substances he had in mind, with their properties, together with certain "older" materials for comparison.

It might seem odd that materials with such low specific properties as the asbestos and glass-based plastics had any range of efficient structural application at all. It was well known, however, that a large proportion of an aircraft structure consisted of those components or elements where stability in compression was the controlling factor in the design. In such cases, over the lower ranges of structural loading, the weight of the optimum structure might vary inversely as $\sqrt[3]{E}$ (Young's modulus) divided by the material density, rather than inversely as the specific strength or specific stiffness. On this basis, as seen from the table, the asbestos plastic materials were considerably superior to aluminium alloy.

The accompanying graph showed that each of the materials had a distinct range of efficient structural use and that, over the lower loading ranges, highly efficient structures on a strength-weight basis might be designed in the comparatively low strength, low stiffness plastic materials.

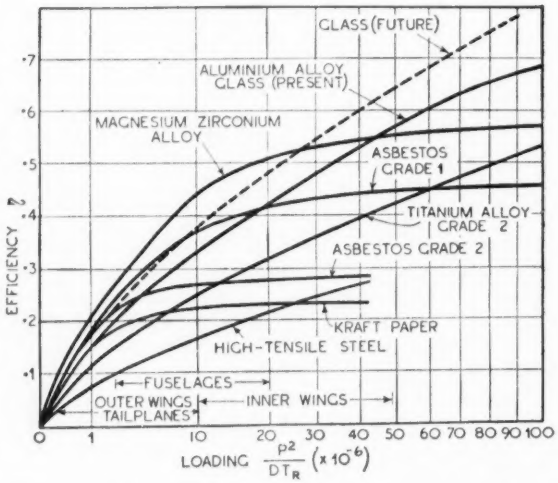
In addition to tensile and compression strength considerations, torsional stiffness might have an important bearing on the weight of a design and, although these materials might show to disadvantage in some cases, experience had shown that in many instances the difficulty might be overcome by a re-arrangement of component-geometry.

The potential structural efficiency of strong plastics might not be enough at this date to induce anyone to embark on design and employment of the methods of manufacture to be described, but there were other very attractive features—for example, final low cost and the attainment on a component of an extremely smooth exterior surface; these things taken together should be sufficient to persuade all technical and manufacturing executives in the industry to give the subject their early attention.

Mr. Pollard then went on to consider each of the selected new materials in turn, starting with asbestos. Of this mineral there were two varieties (chrysolite and crocidolite) which possessed great tensile strength and which were already used in the manufacture of high grade moulding felts. Crude ore was mined and freed from rock, and then treated so as to separate the asbestos into grades according to fibre length and diameter. Length varied from three-quarters of an inch or so downwards; the diameter of a single fibre in a bundle could be as little as 0.0000079in, and the tensile strength of such fibres could be equal to that of piano wire. The refined asbestos could then be converted into asbestos plastic: only a small fraction of it was of sufficiently high quality to be converted into Grade 1 material, such as Turner Brothers' Durestos, but there were numerous applications for Grade 2, which, although possessing less strength than the other, had nearly as great a stiffness on the basis of $\sqrt[3]{E}$.

The plastic could then be moulded in a number of ways. The raw material was supplied in the form of felts, or flock, already impregnated with phenol-formaldehyde. Polymerisation started and continued very slowly from the time the felt was impregnated; and, after a maximum of, say, six months, depending on how the material was stored, it might become useless for its original purpose. On the application of pressure and heat after an initial "breathing" period, however, the molecular action was completed in a quarter of an hour or so. With heat only, the "cure" must take longer to permit the dispersion of water vapour without disruption of the fibre pattern; with pressure it was possible to control this dispersion over a short period of time.

Mr. Pollard then took as an example the construction of a wing from this type of material. Fig. 1 illustrated the lower part of a moulding tool for a half-wing, the top part of the tool having been removed. Strips



Efficiencies of the materials in compression structures (as obtained in tests on Z-section stringers ($F=0.88$)). P=compressive end load (lb/sq in); D=rib depth (in); T_R=rib thickness (in).

cut from the sheets of impregnated felt might be laid in the slots which represented the skin stiffeners, either longitudinal or transverse, and more felts were laid over them. The felts, under pressure, conformed to the required surface and, on the inner side, bonded perfectly during the full cure cycle to the stiffening members previously placed in the die slots. The closed die was then fed into an hydraulic press of appropriate size, and pressure was applied. Hot water under pressure was passed for an adequate period through ductings suitably located in the die; then, by means of a switch-over cock, cold water was passed through the same ductings until the temperature was down to 60 deg C; this might take five to ten minutes. The degree of cooling was decided by handling problems and the question of distortion. The die was then taken from the press, opened, and the moulding removed for fettling, fitting attachment, and so on. Another felt-loaded die should be ready for passing into the press; by having sufficient dies and a matched technique for loading them, the press and its ancillaries—an expensive piece of equipment—could earn its keep.

Assembly was completed by gluing together two half-wing sections, upper and lower, on the median plane. It had been ascertained that the best results were obtained by the use of a hot glue, for example, Redux in joining the wing halves, the essential heat being electrically applied.

Whilst the procedures described above were satisfactory for structures of the wing, fin and rudder type, another method had been evolved for circular sections—such as fuselages—and other special shapes. The basic process in this case was to mould the component completely by the use of a "pressure vessel," on the inside walls of which were laid the felts—few or many of them at any location according to the requirements of the design—with ribbings provided as necessary, together with metal laminates and attachment points.

The pressure in these cases might be supplied by inflating a rubber bag of suitable shape to the desired degree after it had been inserted in the pressure vessel and the ends closed; the whole was then placed in an oven, or possibly surrounded by infra-red lamps.

The rubber-bag method was not entirely satisfactory in all cases, and it was often better to spray the felts after they had been "laid up" in the vessel with latex; the essential thing was to ensure that the felts were forced against the containing vessel with the necessary pressure, but this was impossible if the compressed air got between the felts and the inner surface of the container. Moulding might be done in other ways—for example, the well-known vacuum-pressure method developed by the Royal Aircraft Establishment. In connection with this, Mr. Pollard wished to pay tribute to the work done at the R.A.E. by Mr. J. E. Gordon and his colleagues—and to thank them for the help that had so frequently been forthcoming.

Turning then to the fabrication of non-structural parts, the lecturer described the "no-pressure method"

PHYSICAL PROPERTIES OF THE MATERIALS DISCUSSED

Material	Specific gravity	Design tensile strength (lb/sq in)	E. Young's modulus (lb/sq in)	Specific strength (lb/sq in)	Specific stiffness (lb/sq in)	$\frac{\sqrt[3]{E}}{\text{Specific gravity}}$	Compression strength (lb/sq in)	Density (lb/cu in)
Asbestos phenolic plastic—Grade 1 ...	1.6	24,000	2.8 X10⁶	15,000	1.75 X10⁶	88.0	18,000	0.0577
Asbestos phenolic plastic—Grade 2 ...	1.6	15,000	2.4 X10⁶	9,400	1.50 X10⁶	83.7	11,000	0.0577
Woven-glass polyester laminate	1.7	40,000	2.2 X10⁶	23,500	1.29 X10⁶	76.5	34,000*	0.0613†
Resinated paper ...	1.25	10,000	0.8 X10⁶	8,000	0.64 X10⁶	74.2	7,000	0.0451
Aluminium alloy ...	2.87	68,000	10.5 X10⁶	23,700	3.66 X10⁶	76.3	59,200	0.1035
Magnesium-zirconium alloy	1.8	40,000	6.3 X10	22,200⁶	3.50 X10⁶	102.6	25,400	0.0648
Titanium	4.4	190,000	15.5 X10	42,500⁶	3.52 X10⁶	56.7	170,000	0.1585
Steel	7.85	100,800	28.0 X10⁶	12,830	3.57 X10⁶	38.7	90,000	0.283

* Future, 150,000 lb/sq in. † Future, 0.0758 lb/cu in.

The aeroplane

The Westland Wyvern Mk. IV. A very new naval strike fighter (fuelled and lubricated by Shell-Mex and B.P. Ltd. during its development), still mainly on the secret list. A typical Westland machine, with the characteristic fin and unusual tail-plane. The Rotol eight-bladed contra-rotating propeller is driven by an Armstrong-Siddeley Python turbo-prop engine. Span: 44′, length 42′ 3″.

the pilot

Harald Penrose joined Westland Aircraft 27 years ago, and became a test pilot two years later. Before the war his "crazy flying" with the Westland Widgeon was one of the funniest events at many air displays. He is a pioneer of high-altitude flight, and earned a wartime O.B.E. after his stratospheric researches with the Westland Welkin. Says that "Shell and BP Aviation Service 'gets' you anywhere".

SHELL and BP Aviation Service

Take a look round any number of manufacturers' airfields. The chances are you'll see Shell and BP Aviation Service in operation; right on the spot for the newest machines on their first test flights. There's the same friendly, efficient service at all the major airfields in Britain, where the enthusiastic crews of Shell and BP Aircraft Servicing Vehicles are all ready to jump to it smartly and cater for *your* refuelling needs.

SHELL AND BP AVIATION SERVICE,
Shell-Mex and B.P. Ltd., Shell-Mex House, Strand, London, w.c.2. Distributors in the United Kingdom for the Shell and Anglo-Iranian Oil Groups.

Aircraft Wheel Assembly achieves 68% longer service life at five pounds less weight

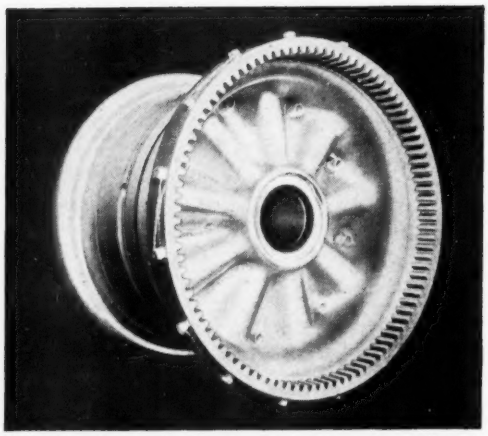
A WELL-KNOWN firm of aircraft constructors has recently found the answer to a landing gear problem. Their twin-engined passenger planes, extensively used on commercial routes, required a more efficient type of wheel brake assembly. They specified that it was to be lighter, and at the same time have a longer service life than the assembly then being used.

The answer was provided by the Aviation Division of the Goodyear Tyre & Rubber Co. Their background of experience and research in this field enabled them to design and manufacture a single disc wheel and brake assembly that weighed 5 lb. less yet gave 6,300 more landings before replacement.

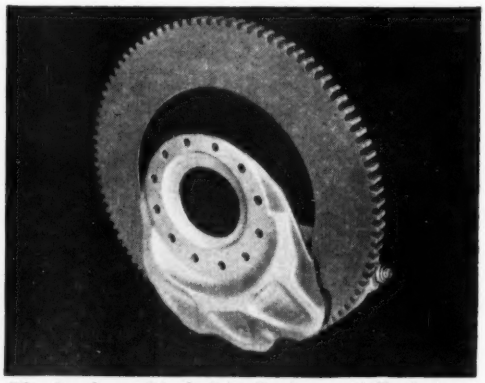
LESS SERVICING NEEDED

In addition, the brake assembly requires the minimum of servicing. Automatic adjustment keeps clearances constant throughout the whole life of the linings; manual adjustments are unnecessary.

The Goodyear Aviation Division can help you with your landing gear problem, too. Technical Representatives are always available to give advice, or to join in consultation with your own design staff. They will help you see the job through, from the drawing board to installation.



The Goodyear wheel, cast from magnesium alloy, is of divided construction comprising inboard and outboard halves which greatly facilitate the mounting and dismounting of tyres.



The Goodyear Single Disc Brake, specially designed for the wheel, completes a thoroughly integrated wheel and brake assembly of high performance.

You can trust

GOODYEAR

AIRCRAFT TYRES
WHEELS
BRAKES

GOODYEAR TYRE & RUBBER CO. (GT. BRITAIN) LTD., AVIATION DIVISION, WOLVERHAMPTON

Future Methods of Construction . . .

in which the felts were laid on a plaster or other pattern, the cured product being then obtained by simply heating the material while it was so placed.

The application of these strong plastics wherever they showed to advantage might require the use of a form of autoclave, certainly for large components. The "pressure vessels" already mentioned had to be strong enough to resist the internal pressure of, say, 100 lb/sq in, or higher, and their provision could be a major manufacturing job, while there were stringent regulations in relation to their use. With an autoclave, however, the manufacture and testing had only to be done once for the production of any number of different shapes of mouldings. When an autoclave was employed, one or more cradles were placed inside it. As these cradles were not subjected to differential pressure, they could be of the lightest construction so long as they did not deform under their own weight and could withstand ordinary shop handling. The felts were placed on the cradles to the desired "lay-up," and then sealed off so that air could not get between them and the cradle faces; heating elements were suitably disposed round the cradles and, for a production run, were fixed permanently to them; a vacuum connection was made to the inside faces to ensure that a proper seal had been made and, finally, with all cradles installed in the closed autoclave, connection was made to the air pressure line and the vacuum pump, and heat was applied for the desired period. Thus a high-pressure moulding was obtained from standard shop equipment at a minimum cost of time and money for tools.

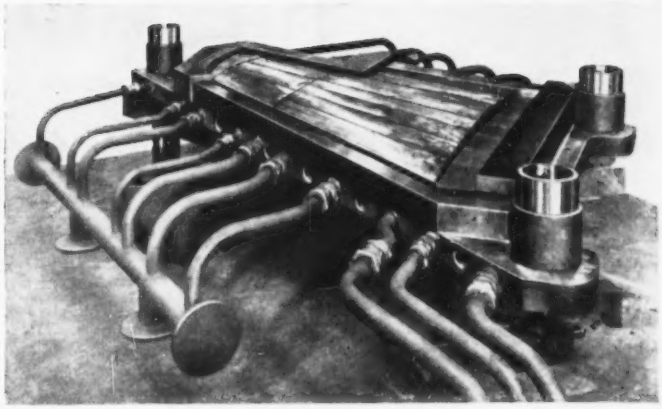


Fig. 1. The lower half of a pressure moulding tool for forming a half-wing from impregnated asbestos. The die is heated during the pressure period.

The next material discussed by the lecturer was glass-fibre plastic. He first referred to two papers that had been read in May of last year—*Glass Reinforced Plastics in the Aircraft Industry*, by G. C. Hulbert, and *The Relationship Between the Composition of Structure and Physical Properties of Glass*, by H. Cole. Certain other points, however, were worth considering.

Glass plastic was first brought to aeronautical notice in connection with radomes, which were made in either single or multiple laminated shells, or fabricated in sandwich form, including the "foamed-in-place" type. In these applications, because of the excellent electrical transparency properties alone, the material had come to stay. The next application which was forced to their notice arose from early fatigue-failures of metal air-conditioning ducts, arising mainly from impulses transmitted from the compressors. On one new type of civil aircraft it was necessary, during the development stage, to strengthen the walls of ducts near the compressors from 24 s.w.g. light alloy to 16 s.w.g. steel to achieve the required life. The use of glass-plastic ducts abolished the fatigue failures, and the original weight was substantially regained.

The position, so far as structure was concerned at present, was indicated in the table and graph, but there were certain facts about glass fibre which required bearing in mind. Unlike asbestos, it was not a natural product. It could be drawn to a very small diameter—0.0002in or less. The difficulties which originally met the fibre-producers might gradually be overcome without the use of the highly expensive platinum crucibles that were still necessary for drawing the finest fibres. Although in the table 40,000 lb/sq in had been taken as the strength of woven-glass laminate, the material was obtainable in forms giving much higher strengths—for example, as thread or as yarn—the difference being due to the imperfections introduced by weaving and the higher resin content on laminating.

With raw material as supplied at present, having a resin content of 30 per cent, the strength values of glass yarn impregnated with a suitable resin might be well in excess of 80,000 lb/sq in with a density of 1.7, which was equivalent to 166 tons/sq in steel. If the fibres were laid at right-angles then the figures were halved, but that gave an equivalent of 83 tons/sq in, which might bear very heavily in favour of glass in the future, the point being that these fibres could be laid exactly where the designer wanted them. That might not be done easily right away, but there appeared to be no reason why any design requiring special orientation of fibre should not be obtained, given the time and money to develop the necessary machinery. There were good reasons for believing that the present value of E might be raised to six or seven $\times 10^6$ or, say, treble its present value. A curve for glass plastic having that value of E was shown dotted on the graph, and it was clear that, if such a value was realized eventually in works' practice, as distinct from in the laboratory only, then aircraft design and construction would be revolutionized rapidly. This paper was concerned only with what could be done now, but the possibilities of glass plastic for the future should not be ignored.

Improved values in the stiffness properties and strength of asbestos might also be possible, and then the asbestos plastic structural efficiency curves would show to greater advantage.

A large question still to be settled was the best and distinctive fields of application for the two plastic materials, and in that connection the following matters had to be taken into account, apart from the fundamental considerations given in the table and graph.

One property of glass laminates in which it was much superior to asbestos plastic was that of resistance to impact. A part might be subjected to violent impact loads, such as would, for example, occur on a bridge pontoon if a section of bridge were dropped endwise on to it. Apart from resistance to local damage, parts made from asbestos plastic in series production were cheaper than glass plastics, and 35 per cent lighter if the "no-pressure" technique was suitable for the moulding of the part required. Where strength (necessitating higher pressure) was a requirement, then there was little in it in the matter of density. For certain applications, glass tape could be wound on a mandrel mechanically.

In general, a prototype component in glass could be obtained faster than one in asbestos, because polyester resin Marco 28C could be cold set; and since no heat or pressure was required, the tooling could be elementary—wood and plaster was adequate. With asbestos plastics, more elaborate tooling was needed because, as already stated, phenolic resins were used which needed heat, and usually some pressure, for curing.

It would be gathered that it was not possible at the present time to define strictly the fields of application of glass or asbestos plastic, and that what at present was good respective practice with these materials might be out of date a year hence—a point which should be kept in mind.

So far as glass was concerned, what was needed was a cloth, yarn or fibre, pre-impregnated with resin before being made to conform to the moulding tool; glass fibre material so impregnated was likely to be available in quantity at an early date, but heat and pressure would be needed for curing this material. Further reference to this matter was made in the section on resins.

The lecturer then went on to say that, in the field of paper fibre plastics (urea-formaldehyde or phenolic resins in cellulose base), there were signs of overcoming the existing tendency towards water-absorption and subsequent distortion. Another "paper technique" which held promise of saving much time was pre-forming—sucking fibres of any type suspended in gaseous or liquid media directly on to a mould by means of a vacuum, thus obviating the time-consuming laying-up process.

The resins which, together with fibres, made up the new materials were also worthy of development. At the present time they contributed little to the strength of the whole, though they did influence the stiffness properties of a laminate to some degree. The present almost exclusive association of phenolic resins with asbestos fibres, and of polyesters with glass, was another field where useful interchange could be investigated, and considerable work was in progress. A vital improvement needed immediately was increased temperature resistance without excessive cost penalty.

There were considerable potentialities for a light-weight, thermally resistant foamed material, firstly as a medium to fill thin-sheeted, lightly loaded structures, thus giving stability to the sheets and eliminating the use of internal metal stiffening; and secondly, as a sandwich core material for radomes, the external surfaces of which were foamed from thin glass-cloth laminates. In the second case, in addition to its mechanical properties, the electrical transparency of the foam was of importance. A wide range of resins had already been used.

On reaching this point, Mr. Pollard transferred his attention from plastics to metals—and firstly to aluminium alloys. He expressed strong general preference for the Redux method of construction over that of riveting, and was also enthusiastic over integral machining where very thick skin plates were concerned—provided that the high initial cost of the plant could be offset by a good production run. A very great deal of research was required in this field, however. Mr. Pollard outlined some of the more obvious problems that might arise, urged that immediate research should be put in hand using existing materials, and suggested that a combination between plastics and metal might well be the answer for large, heavily loaded thin wings.

Magnesium alloys were the next, and penultimate, materials to be considered. They showed great promise in the thinner gauges, but fatigue strength was not as yet entirely satisfactory in thicker plates, and this had held up progress. Magnesium units could be joined very largely by various forms of inert-atmosphere welding (which the lecturer discussed in some detail), and in this way riveting could probably be reduced by about 90 per cent. The most satisfactory magnesium alloys contained about 96 per cent of the metal, together with a little zinc, and either zirconium or aluminium.

Finally, there was titanium, which Major P. L. Teed had extensively discussed at the end of January. The material was very dollar-expensive, but had much to recommend it where temperatures of the 150-600 deg C range were encountered and stainless steel (with its accompanying weight penalty) had otherwise to be used. Engine designers, particularly, would welcome greater availability of titanium alloys.

Mr. Pollard then concluded his address with some general remarks on the progress made during the past 40 years, and the results that might be derived from the materials he had discussed during the coming years.

THE INDUSTRY

Prize-giving at Brough

THE twenty-second annual distribution of merit awards to Blackburn and General Aircraft apprentices took place at Brough on February 16th, when 68 apprentices received some £158 in bonuses. Mr. T. Bancroft (general works manager) presented the awards in the presence of Mr. E. Turner (managing director), Mr. N. E. Rowe (technical director), Mr. T. A. Wolstenholme (apprentice supervisor), Mr. E. Jones (principal of the Hull Technical College) and a large audience of apprentices and their parents.

In the past year 90 probationary apprentices passed through their basic training course and the figure of 55 per cent successes against enrolments was an all-round improvement. Apprentice J. Dutton gained his Higher National Certificate in mechanical subjects, K. G. Wright and R. Winter passed their City and Guilds examinations and 14 others their Ordinary National Certificates.

Mr. Wolstenholme mentioned that in the past 22 years the Blackburn apprentice scheme had provided the equivalent of over 2,000 years of technical training to the aircraft industry. Mr. Rowe advocated engineering as a career, but pointed out that in aircraft engineering only the highest standard was good enough. He referred to the advantages of having products with both military and civil applications, such as the Beverley and the Turboméca gas turbines.

The directors' prize, presented by Mr. Turner, went to W. R. Porter, a tool-room apprentice; excellent reports from foremen convinced the directors that he was the apprentice who most merited their special award.

Aluminium Paint Explained

USED as a basis for certain "silver" aircraft finishes as well as for a vast variety of industrial purposes, Noral "Alpaste"—aluminium pigment for paints and printing inks, is the subject of a well-bound and profusely illustrated 78-page book published by the Northern Aluminium Co., Ltd., Banbury, Oxfordshire. Replacing the original publication, now long out of print, the book contains much that is new; addressed to the user as well as to the paint technologist, it contains chapters on the manufacture, properties and methods of application of a wide variety of protective and decorative surfaces.

Of particular interest is the explanation of the nature of "Alpaste" pigments. They consist not of fine granular particles of aluminium but of minute flat plates of the pure metal which tend to "leaf" in the liquid vehicle that carries them: the term "leaf" is descriptive in that the flakes lie upon one another in the manner of fallen leaves.

Leafing properties are conferred on the metallic particles by interaction of the flakes with stearic acid during manufacture, an oleophobic layer being formed which enables the flakes to float by reason of their large ratio of perimeter to weight. It is admitted that the various factors which produce this phenomenon are not yet fully understood.

Also of interest is the method by which the metal is divided in the first stage of manufacture: hot compressed-air is blown through 99.5 per cent pure molten aluminium, and the fine particles thus obtained are collected and screened; they are then flaked in a ball mill, together with white spirit and stearic acid.

IN BRIEF

Desoutter Brothers (Holdings), Ltd., announce a 1952 profit of £65,366 after taxation. The A.G.M. will be held at Hendon on March 31st.

* * *

As from the issue of March 20th, the publication day of our associated journal *Motor Transport* will be changed from Saturday to Friday.

* * *

The British Aluminium Co., Ltd., have transferred their Leeds branch office to Martins Bank Chambers, Vicar Lane, Leeds 1, to handle sales of unwrought and fabricated aluminium and its alloys in Yorkshire and Lincolnshire. Mr. A. E. Heeley continues as manager and the telephone number (Leeds 28343) is unchanged.

* * *

Mr. John Tyzack, C.B.E., who, after retiring from the R.A.F. with rank of group captain in 1946, joined B.E.A. and became their director of administrative services, informs us that he will shortly be joining the board of the Concrete Development Co., Ltd., and will be appointed managing director. He left B.E.A. in July last.

* * *

Brynmawr Rubber, Ltd., are re-organizing their subsidiary selling company, Brynmawr Rubber (Sales), Ltd. Until further notice, correspondence concerning products should be addressed to the latter company at Brynmawr, Breconshire. Brynmawr Rubber (Sales) has an undertanding with Maj. H. L. Anderson and Mr. T. T. Ottowell, whereby these two retiring directors will revive their former business; known as the Hemisphere Rubber Co., Ltd., it will have offices at 70 Finsbury Pavement, London, E.C.3. Also announced is the appointment of Mr. R. Boole, A.M.I.Mech.E., as technical manager of Brynmawr Rubber, Ltd.

P.S.C. Applied Research, Ltd., of Toronto, a company of the Hunting Group, is to move into enlarged laboratories on April 1st, making possible a threefold increase in development and productive capacity. The company specializes in electronic, mechanical and optical devices used in industry, air survey, navigation and photogrammetry, and is a subsidiary of the Photographic Survey Corporation, Ltd.

* * *

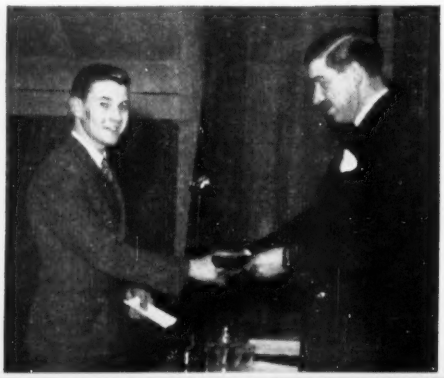
We regret to learn of the death, on February 18th, of Mr. J. A. Peters, founder and managing director of Petbow, Ltd., the Sandwich (Kent) manufacturers of mobile generating plant, aircraft ground-starters and associated equipment. Mr. Peters designed and flew aircraft before the first world war, and made a flight from London to Madrid; he was also concerned with the design of the Robey-Peters fighter during that war.

The late Mr. J. A. Peters.

* * *

Ease of removal of aircraft-cabin curtains for cleaning and sterilization is, it is stated, one of the factors that have led Sabena (Belgian Airlines) to select "Rufflette" fittings for all their window, sleeping-berth and doorway curtains. This brand of tape, hooks, rings and rails is made by Thomas French and Sons, Ltd., Chester Road, Manchester 15.

APPRENTICES REWARDED: Below is a photograph taken at the Napier apprentices' prize-giving, reported in our issue of February 27th; it shows R. L. Allan, best student apprentice of the year, receiving a trophy from Mr. H. Sammons, the managing director. In the centre picture, taken at the Blackburn and General Aircraft prize-giving, Apprentice W. R. Porter is seen receiving a wrist watch from that company's managing director, Mr. E. Turner. The third photograph is that of David White, who, after three years as an apprentice in the engine division of the Bristol Aeroplane Co., Ltd., left to take an engineering course at Bristol University, and has just been awarded the coveted Hele-Shaw Medal given by the Institution of Mechanical Engineers for outstanding success in the Ordinary and Higher National Certificate courses.



CIVIL AVIATION

(Right) Two of Japan Air Lines' six Skymasters.

NEWS FROM JAPAN

JAPAN'S future civil-aviation policy was determined recently at a special Cabinet meeting, when an act was drafted for the establishment of a Japan Airways Corporation to operate all international routes and the main domestic services. The Corporation was decided to be essential if Japan were to hold a competitive position relative to the national airlines of other countries (already 11 are operating into the country). The Government will supply half the capital of $5.6 m (£2m), the remainder being publicly invested.

Other provisions of the proposed act are reported to be as follows: Senior executives will not be permitted to have other commercial interests without Government approval; selection of routes, senior appointments and distribution of profits will be subject to the approval of the Minister of Transportation; the Corporation will be required to present its report and accounts two months after the end of each financial year; the Government will appoint the members of the establishment committee responsible for setting up the Corporation; provision shall be made for further public investment in the Corporation.

A Japanese correspondent reports that the state airline will be set up in April and will begin operations two months later; he adds that the Government apparently intends, as far as possible, to leave the Corporation to manage its own affairs.

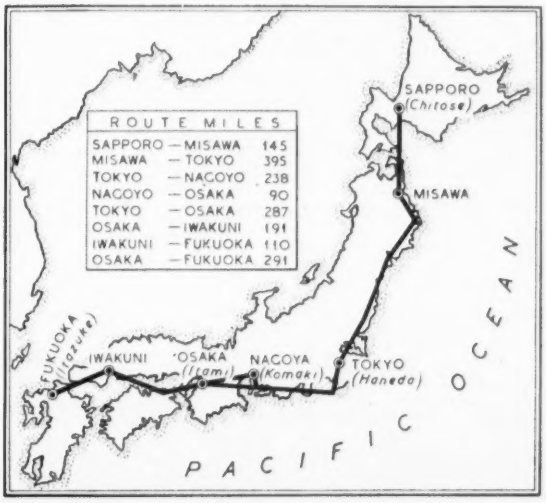
Although smaller companies are expected to begin some regular and non-scheduled domestic services in the near future, Japan Air Lines have so far operated the only national services since the restoration of Japanese sovereignty—at first with DC-4s and Martin 2-O-2s leased from Northwest Airlines, but lately with its own Skymasters. It now seems certain that J.A.L. will be incorporated in the new state airline, although details of the merger have not yet been settled.

The route network operated by J.A.L. is shown at the foot of this page. Traffic and financial statistics for scheduled operations during the calendar year 1952 are as follows:—

Number of passengers flown	102,893
Revenue passenger-miles flown	42,895,480
Seat-miles available	55,747,284
Revenue passenger load-factor	76.9 per cent
Revenue freight ton-miles (metric)	92,056
Revenue mail ton-miles (metric)	74,986
Total revenue ton-miles (metric)	3,205,475
Overall load-factor	58.7 per cent
Freight revenue (approx.)	£26,000
Mail revenue (approx.)	£34,000

No revenue figure for passenger operations has yet been published. The total number of passenger-miles flown on non-scheduled services was 366,934.

The J.A.L. fleet at present consists of six DC-4s or C-54s of various mark; these aircraft have been registered JA-6001-7 inclusive and named, respectively, *Hakuba*, *Takachiho*, *Haruna*, *Tokachi*, *Aso* and *Hodaka*. Last year the company announced an order for two Comet 2s, for delivery in 1955. Presumably the order will now be transferred to J.A.L.'s successor.



NIPPONESE NETWORK: Operating on these domestic routes, J.A.L. have a virtual monopoly of airline activity in Japan. As reported above, the company will probably be merged with a new State corporation, which is expected to be in operation by midsummer.

RENFREW'S NEW TERMINAL

THE Scottish division of the M.C.A. announces that a contract for the reinforced concrete structure of the new terminal building at Renfrew Airport, Glasgow, has been let and that work on the site has started. Contractors for this portion of the work are A. A. Stuart and Sons (Glasgow), Ltd., whose consulting civil engineers are Blyth and Blyth, Ltd., of Edinburgh. The building has been designed by Mr. W. H. Kininmonth, A.R.S.A., F.R.I.B.A., F.R.I.A.S., of the Edinburgh firm of Messrs. Rowand Anderson, Kininmonth and Paul. Mr. Kininmonth is also a Member of the Royal Fine Arts Commission for Scotland.

Intended to be ready in time for the summer season of 1954, the new building is claimed to incorporate the latest ideas on the design of terminal facilities: ". . . Glass walls and cantilever construction will make the interior of the building unusually spacious and well-lighted. A large dining gallery above the concourse will give visitors an extensive view of the airport and of the comings and goings of aircraft and their passengers on the apron. Covered ways extend to the extremities of the apron, giving shelter to passengers on their way to the aircraft . . ." As at many North American airports (and, of course, as at railway stations), numbered gates will guide passengers to the correct portion of the apron.

Passenger traffic at Renfrew increased from 140,000 in 1951 to 157,000 in 1952, and this trend is expected to continue. The buildings have accordingly been designed to permit of further expansion if necessary. As shown in the drawing overleaf, the building is technically interesting in that the roof of the main concourse, in cantilever construction, is suspended from a great arch in reinforced concrete, which forms the dominant feature of the front elevation. Cantilever construction has also been adopted for the new control tower.

"SAFARI" FREQUENCY DOUBLED

SINCE February 28th the frequency of the jointly operated Airwork/Hunting Safari Service to East Africa has been increased from one service weekly to two. Aircraft now leave this country on Saturdays and Tuesdays, and begin their return journey from Nairobi on Wednesdays and Saturdays.

It was announced recently that during the first six months of the Safari Service (inauguration was on June 14th last year), the Vikings of both companies had operated with 90 per cent of seats filled, and that forward bookings accounted for 83 per cent of capacity. The increase in frequency is therefore seen to be fully justified by an abnormally high demand.

Airwork, Ltd., and Hunting Air Transport, Ltd., also announce the conclusion of an agreement with East African Airways Corporation enabling passengers to book through tickets at low rates to Dar-es-Salaam, Mombasa, Kisumu, Lindi, Tanga, Zanzibar and Tabora.

TWO I.C.A.O. MEETINGS

DELEGATES from 13 nations and four international organizations are now attending a special I.C.A.O. air-navigation conference in Montreal. Previous conferences have dealt with individual aspects of navigation; this is the first attempt by I.C.A.O. to examine and interrelate such problems as approach-and-landing aids (including possible means of achieving fully

FILL-UP with Esso aviation kerosine for a U.A.T. Comet 1A at Nouasseur, Casablanca. Regular Comet services between Paris, Casablanca and Dakar were inaugurated by this French independent airline on February 19th.

CIVIL AVIATION . . .

automatic landing); methods of expressing visibility and cloud-base information; standard holding patterns; position, operations and meteorological broadcasts from aircraft in flight; met. transmissions to aircraft; and the development of radar procedures. Chairman of the conference is Mr. G. J. Warcup, head of the United Kingdom delegation.

It is also announced by I.C.A.O. that a special conference will be called at Brighton on July 8th (the Organization's annual assembly is to begin there three weeks earlier) to extend the 14-nation agreement for maintenance of the North Atlantic weather stations. Six other nations who make use of the stations, or intend to do so in the near future, will be represented, together with those who now pay for the service.

SKYWAYS YORK INQUIRY

AN M.C.A. announcement on March 8th stated that a public court inquiry will be held into the causes and circumstances of the loss of the York aircraft G-AHFA belonging to the Lancashire Aircraft Corporation, Ltd. (incorporating Skyways, Ltd.), which occurred over the North Atlantic on February 2nd, 1953.

PANAM TESTS DECCA

ONE of the Frankfurt-based DC-4s of Pan American World Airways is to be temporarily equipped with a Decca Navigator unit with Flight Log presentation, of the type adopted by B.E.A as the standard short range navigation aid. A PanAm statement says that the installation is being permitted "in pursuance of its policy not to exclude full and unbiased evaluation of any aid which might improve the safe, reliable and economic methods of its operation." Presumably to avoid misinterpretation of this decision, the airline adds that "at the I.C.A.O. European-Mediterranean Regional Air Navigation meeting a year ago, it was recommended that full experience should be obtained in the use of Decca for airways and general flying. It was agreed, however, that this evaluation should in no way prejudice the implementation of the standard I.C.A.O. V.O.R. system. Pan American has had its whole fleet equipped with V.O.R. for many months and will continue to press for the early installation of V.O.R. ground facilities for short-range navigation both in Europe and other parts of the world."

SWISSAIR TRAFFIC IN 1952

REVIEWING its operations during the calendar year 1952, Swissair announces a 16 per cent increase in revenue from £4,775,000 in 1951 to £5,537,000, but observes that the improvement is offset by considerable increase in operating costs. The distance flown by the company's aircraft dropped by 1.5 per cent —from 6,550,000 miles in 1951 to 6,350,000 miles. Reasons for this decline include the effects of the American oil strike in May and June last year, cancellation of flights on certain European and Persian Gulf routes and a considerable shortage of crews. However, the use of larger aircraft resulted in an 11.2 per cent increase in capacity offered and in increases in the weight of freight and mail and the number of passengers carried by, respectively, 9.3 per cent, 35.6 per cent and 3.8 per cent.

On a ton/mile basis the regional distribution of Swissair's traffic was as follows: Europe, 55 per cent; America, 32 per cent; the Near East 13 per cent.

SOLENTS FOR SALE

AFTER a partial overhaul, the eleven Solent flying-boats which have been stored at the Belfast works of Short Bros. and Harland, Ltd., since 1950, will be flown to Hythe for further reconditioning. Under a newly announced agreement with the Ministry of Civil Aviation, the International Aircraft Sales Company will restore the aircraft to full C. of A. standards with a view to selling them to British or overseas operators. Headed by an American, Mr. Hugh Walker, the latter company is reported to have "cornered" two thirds of the available Solent spares two years ago.

Last November the Minister of Civil Aviation said in Parliament that the price asked for the aircraft was £35,000 each but that reasonable offers would be considered. Although some British operators are known to have been interested their offers were apparently considered inadequate, for the Solents are still on the market. The I.A.S.C. will act as brokers, and its willingness to invest capital in overhauling the aircraft would seem to indicate that there are good prospects of sale.

Eighteen Solent 3s were originally bought by B.O.A.C. at £150,000 each in 1948, and were operated on the South African routes until late 1950, when they were withdrawn as being unsuited to the Corporation's fleet and route patterns. Two have since been destroyed, eleven are awaiting re-sale and the remaining five are in service with three different operators.

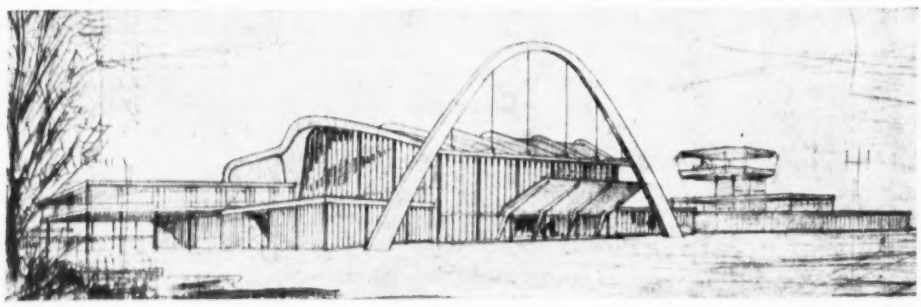
AQUILA/SILVER CITY MERGER

LAST week's preliminary announcement concerning the sale of Britain's sole remaining flying-boat operator, Aquila Airways, Ltd., has now been confirmed. It is stated that the entire share capital of Aquila has been acquired "partly on a cash and partly on a share exchange basis" by Britavia, Ltd., parent company of Silver City Airways. The Aquila administration and booking offices will move from Curzon Place, London, to the Britavia premises in Great Cumberland Place, but the flying-boat concern will continue to operate as a separate entity under its managing director, Mr. Barry Aikman. The official statement says that early steps will be taken to increase the flying-boat fleet and facilities of the company and to foster the services to Portugal and Madeira.

Silver City Airways, incidentally, were notified last week that the Minister of Civil Aviation had approved for a seven-year period their application to operate a scheduled freight, vehicle and passenger service between Southampton and Guernsey and/or Jersey. In order to safeguard the traffic of passenger airlines serving the Channel Islands, Silver City will be allowed to carry only three passengers not associated with freight or vehicles.

THE COMET ACCIDENT

INVESTIGATION into the loss of the C.P.A. Comet 1A CF-CUN at Karachi on March 3rd is being carried out by the Pakistan authorities. At the invitation of the Pakistan Government, the Ministry of Civil Aviation has sent Mr. T. R. Nelson and Mr. J. H. Lett to Karachi as official observers at the inquiry. Observers also include Mr. John Cunningham, chief test pilot of the de Havilland Aircraft Co., and other members of the manufacturing company, together with representatives of the Canadian Government and Canadian Pacific Airlines. The careers of a number of those who lost their lives in the accident are the subject of notes on page 326 of this issue.



ARCHITECT'S IMPRESSION of the new terminal building and control tower which, as reported on the preceding page, are now under construction at Renfrew Airport. Reminiscent of certain "Festival" buildings in appearance, the main building has a 48ft high concrete arch as its dominant feature.

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* *Manufactured by S.M.D. of Slough.*

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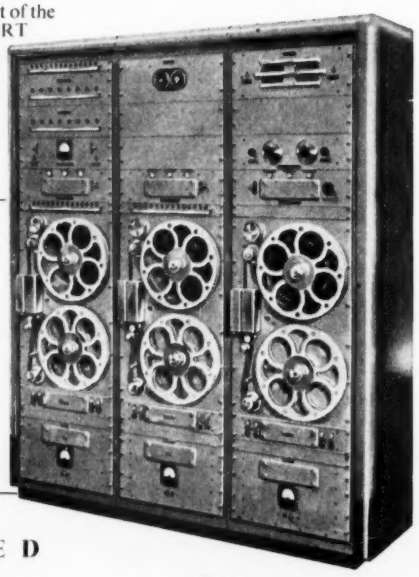

. . . and these are further noteworthy features

- recordings are made on magnetic tape, which can be re-used indefinitely.
- *separate* de-magnetising unit, complete with locks, permits erasure of signals by authorised staff only.
- automatic changeover of tape reels (with ample overlap) ensures unbroken "listening watch".
- standard 4-channel equipment readily expanded (in 2-channel steps), to maximum of 14-channels.

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CIVIL AVIATION . . .

B.E.A.'s NEW BOOKINGS SYSTEM

AN important stage in B.E.A.'s campaign to reach full financial independence by increasing efficiency was reached on March 3rd, when Lord Douglas of Kirtleside opened the new "All-electric Flightmaster" at Dorland Hall. Rapid growth of the Corporation's passenger traffic has placed a severe strain on the reservations system, and a need for streamlining of methods of selling and booking space has become urgent in recent months. Last year the Corporation's aircraft carried over 1.3 million passengers, and this year the total is expected to be 1.7 million. Further increases are anticipated in the design of the Flightmaster, which can handle 6 million bookings in a year. The system cost £40,000 to install, but is said to be capable of saving £80,000 annually in salaries.

This saving is effected in two ways : clerks spend far less time in checking the availability of seats, and each clerk (having information on all flights at his fingertips) can deal with every type of enquiry instead of dealing only with bookings on a regional group of services. The new system not only increases the productivity of reservations staff but assures much better service to the public.

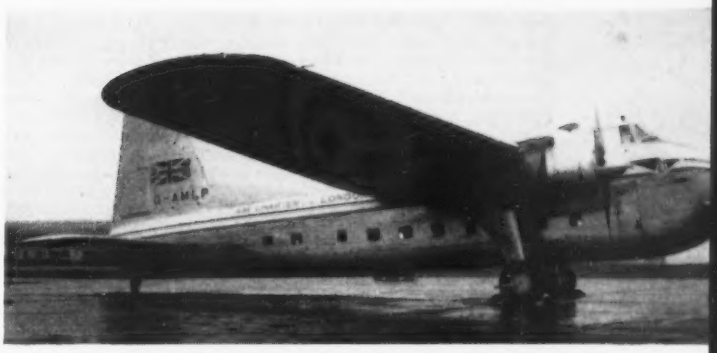
The workings of the Flightmaster are best explained by a brief description of an actual booking operation. On receipt of a call from an intending passenger or his agent, the telephone operator at Dorland Hall plugs the call into a cyclic distributor which automatically connects the caller with a disengaged clerk in the reservations section. The clerks—up to 48 of them—are seated at a long conveyor-belt table. Each clerk has an individual telephone set and shares a "consulting unit" (see photograph below) with one other clerk.

The consulting unit tells the clerk whether or not seats are available on any service to be operated within the following month (four months in the case of Channel Islands services); the clerk depresses keys according to the code number allocated to a service and the day on which seats are required. If all the seats are booked, a red light glows, and the clerk must offer a selection of other services. The telephone set enables him to contact other departments (without disconnecting the caller) for further information if, for example, the passenger wishes to book on a date not covered by the consulting unit.

The passenger's name and details of seats booked are then entered on a card which the clerk places in one of 15 colour-coded troughs situated along the centre-line of the long table over continuously moving conveyor belts. On encountering one of several appropriately placed wooden blocks towards the end of the table the card is picked up by a checker, who ticks off the newly booked seats on a specially prepared sheet—there being one sheet for each scheduled service. The card is then replaced in the appropriate lane on the moving belt and carried farther down the line to the filing section. At this point it is sometimes found that only part of the passenger's journey is to be made *via* B.E.A. Teleprinters are situated at the end of the conveyor belt, enabling space to be booked on other airlines. When confirmation of such bookings has arrived, a slip bearing the other airline's reply is gummed to the card; this is returned to the filing clerk, who telephones the information to the passenger. The teleprinters are also used to send a complete passenger-list (based on the cards) to the airport before a flight takes off.

When the checkers find that a service is fully booked they telephone the central space-control officer, who inserts a small plug in one of 32,000 sockets separated according to route, service and date (red plugs show that a service is booked; yellow plugs indicate cancellation). The plug completes an electrical circuit and produces the red light which appears on the consulting-unit keyboard when no seats are available.

SELLING SPACE: With the introduction of the new Flightmaster equipment described above, B.E.A. now claim to have the world's most advanced system of selling and reserving space on passenger flights.



BRISTOL FREIGHTERS are giving valuable service on the "little airlift" between Berlin and Western Germany; this example is being used by Air Charter, Ltd., to carry cargo on the Berlin-Hamburg route. It is pictured at Filton, where the company recently took delivery.

Before the advent of the Flightmaster, clerks had to consult a sheet bearing the names of passengers already booked. Apart from the time wasted in physical movement, further delay resulted when more than one clerk wished to consult the same sheet at the same time.

Systems comparable to the Flightmaster are already in use on the other side of the Atlantic. Lord Douglas has inspected the T.W.A. installation at Kansas City and the T.C.A. machinery in Toronto, but expresses confidence that this British system represents an advance over all others. Credit for its evolution is attributed mainly to Messrs. J. Guy (reservations manager), F. J. Friend (ground communications superintendent), and L. R. Dougal (assistant reservations manager). Rentrix, Ltd., produced the main components of the Flightmaster (the space-control installation and consulting units) and the intercomm. telephone equipment; the Lamson Engineering Co. Ltd., were responsible for the multi-lane vee-trough conveyor.

APPLICATIONS APPROVED

SUBJECT to the usual conditions, the Minister of Civil Aviation has approved the following scheduled services by British airline operators :—

B.K.S. Aerocharter, Ltd., a seasonal inclusive tour between Southend and Majorca (Palma) *via* Lyons (technical stop); circular tours on the Southend-Calvi-Palma-Southend route; a seasonal inclusive tour between Southend and Corsica (Calvi) *via* Lyons (technical stop). B.O.A.C., a normal scheduled service on the route London-Zurich-Rome-Mafraq or Amman-Baghdad. In each case the approval is for a period of seven years.

ITALIAN AIRWAYS PLANNED

A FURTHER stage in the evolution of a complete European airways system is scheduled to take place shortly when Italy introduces a system of advisory air routes. Inauguration has been delayed by late delivery of some of the equipment, but this has enabled training of air-traffic controllers to be completed. The system in use is similar to that at Airways Control, Uxbridge, and the control centre of the southern half of the pattern is based at Ciampino, the airport for Rome. Milan controls the northern section, and communication between the two centres is based on teleprinter landlines. As yet there is no direct communication between the Italian and adjoining centres, so that airways control virtually ceases at the Italian border. Eventually, however, the system will be integrated with other European centres, either by telephone, teleprinter, or, in the case of Malta and Athens, radio teletype.

The airways, which are ten miles wide, are limited in altitude only on two sectors—between Rimini and Bolzano on advisory route 512, and between Piacenza and Florence on route 309, where a maximum height of 20,500ft is laid down due to military activities. No date has yet been fixed for implementation, but further delay is thought to be unlikely.

BAHAMAS IMPROVEMENTS URGED

LAST week, at the invitation of the Governor of the Bahamas, Sir Miles Thomas, chairman of B.O.A.C., addressed the Nassau House of Assembly. In the course of his speech he mentioned the possibility of introducing jet airline services between New York, the Bahamas and Jamaica, stating that such flights

CIVIL AVIATION . . .

would have to await the results of exploration of the upper air over the North Atlantic. Sir Miles also stressed the necessity for the provision of a suitable airport if Nassau was to avoid becoming an "aerial backwater"; Oakes Field was hardly ideal for today's large piston-engined aircraft, much less jets and turboprops. He concluded by urging the rehabilitation of Windsor Airfield, which was better able to meet the future requirements of all operators and would also reduce the inconvenience to residents caused by aircraft noise.

K.L.M. VETERAN HONOURED

THE appointment is announced of Captain Adriaan Viruly as commodore on the North Atlantic routes of K.L.M. His former post of general chief pilot, which he has held since the end of the war, now lapses. Since April, 1927, this famous Dutch airman has logged over 17,000 flying hours, flown approximately 3 million miles and visited 58 countries, carrying 60,000 passengers and 4,000 tons of freight. Between flights he has found time to write 17 books on aviation and he also enjoys great popularity in the Netherlands as a lecturer.

BREVITIES

THERE were 10,400 air transport movements at U.K. aerodromes in January, approximately 4 per cent less than in the corresponding month of 1952. The number of passengers handled (144,700) increased by 9 per cent, but there was a 7.5 per cent decrease of freight on and off loaded—from 3,100 to 2,868 tons.

* * *

Mr. Pierre Desautels has been appointed to the newly-established position of T.W.A. overseas director, with H.Q. in Paris.

* * *

On April 1st Philippine Air Lines will transfer its German operations to Hamburg from Frankfurt, which P.A.L. have served since July 30th last.

* * *

"As part of a policy of expansion, particularly in Jamaica," B.W.I.A. announces the appointments of Messrs. R. M. Barton as sales manager and R. E. W. Willis as manager at Jamaica.

* * *

Representatives of the Folkestone and Hythe councils have announced their decision not to buy Lympne Airport from the Ministry of Civil Aviation. During 1952 Silver City paid £12,000 in landing fees at Lympne.

* * *

A correspondent in Brazil reports that increased use is being made there of small helicopters to fight locust invasions and spray plantations; he adds that "British helicopters would interest big planters, the government and small carriers in the interior, but prices are still considered too high."

* * *

Demonstration flights for military and civil operators are at present being performed by a Nord 2501, the type selected as the standard French military transport. Powered by two Bristol Hercules 758s, the Nord 2501 employs the twin-boom configuration which has proved so successful in the Fairchild Packet.

* * *

The Brazilian airline VARIG is considering the attachment of Turboméca auxiliary jet units to some of its 23 DC-3s, having recently taken delivery of a Curtiss Commando equipped with one of these units under each wing to improve take-off performance. The same company is also reported to have asked the Bank of Brazil for exchange cover to import Lockheed Super Constellations.

* * *

To enable their Constellations to be converted to high-density seating in preparation for the introduction of cheaper fares to India on October 1st, Air-India International, Ltd., are reducing the frequency of their London-Bombay services from four to three weekly. This reduction was introduced on February 22nd and takes effect until April 5th. Air-India International have also announced the introduction of Dusseldorf from February 21st as a calling point for the Saturday London-Bombay service and the return Calcutta-London service, which also begins each Saturday.

* * *

S.A.S. have dropped their plan to offer two standards of travel in single aircraft operating the Stockholm-Copenhagen-London route. The company originally proposed to carry 50 "tourist" or standard-class passengers in the front compartment and 16 first-class passengers in the rear cabin of the DC-6Bs which will be used when the cheaper fares come into effect in April; it is now announced that "all tourist" DC-6Bs will be used instead. Other S.A.S. services from London to Scandinavia will be operated by 55-seat DC-4s.

* * *

Speaking at a C.A.B. hearing on six applications by American non-scheduled airlines to operate regular transatlantic freight services, a representative of the Department of Defence emphasized the need for a reserve of air transport facilities, equipment and personnel to be available in the event of mobilization. He added that the value of transatlantic and Middle East air cargo services was underlined by international developments.

* * *

September, 1954, has been given as the probable inaugural date of a B.O.A.C. Comet 2 service between Sydney and London. Comets will probably operate the first-class service on the Kangaroo route, completing the 10,600-mile journey in 42 hours. The present Constellation service, operated jointly by B.O.A.C. and Qantas, takes four days; the single fare is £294, but this will probably be reduced to £220 when the new standard fares take effect in April next year.

* * *

According to an announcement made in Cologne last week the new Lufthansa will not, as earlier reported, buy any second-hand civil aircraft as an interim means of opening the first post-war German air routes. The choice of an aircraft for medium-range service is, therefore, narrowed down to the Viscount and Convair 340. Since neither type could be delivered before 1955 it seems possible that the first Lufthansa services will be operated by another airline on a contract basis.

* * *

Since announcing greatly reduced fares for carrying passengers and vehicles on their cross-Channel ferry service, Silver City Airways have experienced a sevenfold increase in bookings. During the first two months of this year 3,719 bookings for cars were received, compared with 507 during the corresponding period last year, and for 2,225 motor cycles, compared with 532. The result of reducing the Lympne-Le Touquet fare for a bicycle from £1 to 5s was to increase the number of bookings from 34 to 360. The first of Silver City's new Mk 32 Freighters should be delivered this month and the whole fleet of six will be in service by July.

* * *

Following the recent M.C.A. decision to withdraw certain essential services and equipment from Yeadon Airport, Leeds, Lancashire Aircraft Corporation announce that they will vacate the airfield by the end of March. Lancashire will continue to operate scheduled services to the Isle of Man from Squire's Gate, Blackpool and arrangements have accordingly been made with Yorkshire coach operators which will enable former users of Yeadon to book combined road and air tickets on these latter services. It is planned to provide similar facilities for passengers wishing to fly to Jersey

UNUSUAL LOAD for this Dakota of B.K.S. Aerocharter, Ltd., was the complete roof of the "big top" for Chipperfields' Circus. Weighing six tons and covering about an acre, the canvas was packed in 12 bales; two flights were required to bring it from Ostend to Southend, where the Dakota is seen unloading. Lep Transport, Ltd., arranged the consignment.

SERVICE AVIATION

Royal Air Force and Naval Aviation News

FIRST OF MANY: Illustrated above is the first production Percival Provost T.1 to be delivered to the R.A.F. Selected as the standard basic trainer for the Service: large numbers are on order.

New Fighter Command Chief

THE Queen has approved the appointment of A.V-M. Sir Dermot A. Boyle, K.B.E., C.B., A.F.C., as A.O.C.-in-C. Fighter Command, in succession to Air Marshal Sir Basil E. Embry, K.C.B., K.B.E., D.S.O., D.F.C., A.F.C. Sir Dermot will assume the acting rank of Air Marshal and the appointment is with effect from April 7th.

A.V-M. Sir Dermot A. Boyle has, for the past two years, been A.O.C. No. 1 Group, Bomber Command, and last year, it will be remembered, he led the R.A.F. goodwill tour to Latin America, flying in one of No. 12 Squadron's Canberras. In September last he flew a Canberra from Binbrook, Lincolnshire, to Malta and back, the 2,914-mile journey being accomplished in 6 hr 5 mins.

A.V-M. Sir Dermot A. Boyle, K.B.E., C.B., A.F.C.

Before going to No. 1 Group, Sir Dermot had served at the Air Ministry, first as Director General of Personnel (1) and later as Director General of Manning. Before the war he was Chief Flying Instructor at Cranwell and during the war he served with the Advanced Air Striking Force, Bomber Command and 2nd T.A.F.

A further announcement is to be made in the near future regarding Sir Basil Embry's next appointment. His name has been mentioned as a successor to General Lauris Norstad as C-in-C. Allied Air Forces Central Europe.

No. 60 Squadron Presentation

RECENTLY, at the Dorchester Hotel, London, Vickers-Armstrongs and Rolls-Royce jointly presented a model of the last Spitfire to No. 60 Squadron, which was the last R.A.F. Squadron to operate Spitfires in action. The unit is at present abroad and the model was accepted on its behalf by W/C. Duncan Smith, a former C.O.

No. 60 has a notable history. In the 1914-18 war it was one of the top-scoring fighter squadrons. Majors Bishop, V.C.; Ball, V.C.; McCudden, V.C., all served with the unit and Major Smith-Barry was the second commanding officer.

At the end of the first war the unit was sent to the North-West Frontier, where it remained until the second outbreak of hostilities, taking part in both Burma campaigns.

West Country R.N.V.R. Squadron

A NEW Royal Navy Volunteer Reserve air squadron, No. 1834, is to be formed this year at Yeovilton in Somerset.

The squadron, the eleventh R.N.V.R. air unit, will form part of the Southern Air Division, which is at the present at Culham, Berkshire, but will shortly move to R.A.F. Station, Benson, Oxfordshire. It will be equipped with Seafires.

Transport Command Change

AFTER more than two years at H.Q. Transport Command, first as Command Engineer Officer and later as Senior Technical Staff Officer, A. Cdre. J. A. Hawkings, C.B.E., M.I.Mech.E., has gone to the Ministry of Supply as Director of Servicing Research and Development.

G/C. V. D. Morshead, with the acting rank of air commodore, has succeeded him as S.T.S.O. at Transport Command.

Army and Navy at Twickenham

INTER-SERVICES tournament matches usually produce more inspiring football than that witnessed by the Queen and the Duke of Edinburgh at Twickenham on March 7th. In fine weather the Army won a fast, open game by a penalty goal, three points, to nil. The navy had several chances to equalize, but their kicks failed. Tackling was swift and hard on both sides, and was too good for the many ineffectual attacking movements. On the whole, the Army were the more lively team and were always ready to open up passing movements—MacDonald, on the wing, had a very good second half, while for the Navy, Holgate was the most dangerous outside.

PRESENTATION: Major G. W. Milholland, U.S.A.F., with Air Marshal Sir Basil E. Embry at the presentation of the Dacre Trophy—for weapon training—to No. 74 Squadron R.A.F. Major Milholland, who commands No. 74, is in Britain under the exchange scheme.

On February 14th the R.A.F. and Navy drew three-all. The third game of the tournament is on March 28th, when the R.A.F. will meet the Army.

St. Athan Command Change

IN succession to A. Cdre. John Mutch, C.B.E., who is going to the Air Ministry as Director of Technical Training, A. Cdre. J. D. Baker-Carr, C.B.E., A.F.C., is to take over command of No. 4 School of Technical Training at R.A.F. Station St. Athan, Glamorgan. A. Cdre. Baker-Carr took the Imperial Defence College course last year.

Dunning Cup

AWARDED to the R.A.F. squadron achieving the highest standard on the Joint Anti-Submarine School Unit Training Course, the Dunning memorial cup has been won by No. 37 Squadron.

In 1917, Sqn. Cdr. Dunning was the first British officer to land an aircraft successfully on a ship under way.

Jungle King

THE biggest exercise held by Bomber Command since the war—to be known as "Jungle King"—will take place between Monday next, March 16th, and Sunday, March 22nd. It will be directed by the A.O.C.-in-C. Bomber Command, Air Chief Marshal Sir Hugh P. Lloyd, whose last big exercise it will probably be before his retirement.

During the six days Canberras, Washingtons and Lincolns will make intensive mock attacks against Continental targets, including live-bombing sorties on the new bombing range at Nordhorn, in north-western Germany.

In addition to being a realistic test of operational tactics and techniques, "Jungle King" will also be a large-scale trial of the Bomber Command war organization. Command and Group Headquarters and the bomber stations will be fully operational for the 24 hours of each day. Reservist officers and airmen will augment the regular staffs.

Canberra squadrons, operating from stations in Lincolnshire, will carry out more sorties during the exercise than either the Lincoln or Washington units. They will operate for the first time in a major exercise in the photographic reconnaissance and target-making rôles. They will be employed by day and night, on low- and high-level raids.

Fighter opposition will be provided by squadrons of the Allied Air Forces Central

SERVICE AVIATION...

Europe, including R.A.F. units of the 2nd A.T.A.F. R.A.F. Fighter Command will seek to intercept the bombers as they return from their Continental missions, and to deal with day and night intruders which may attack bomber bases in the United Kingdom.

"Jungle King" is the first large-scale R.A.F. exercise for the primary benefit of Bomber Command since Exercise "Bulldog" was held in 1949.

R.N.V.R. on Cruise

ON March 6th, 200 Naval Reserve officers and ratings, 35 of whom were from R.N.V.R. air squadrons, left Britain in H.M.S. *Perseus* for the United States, where the carrier will take on board equipment provided under the military aid programme.

The ship is expected to be away for 27 days, during which period the reserves will undergo sea training. On the way home a call will be made at Bermuda.

Air H.Q., Singapore

WITH the agreement of the Governor of Singapore, the title of Headquarters No. 230 Group, Seletar, under the command of A. Cdre. W. M. L. MacDonald, has been altered to Air Headquarters, Singapore. The A.O.C. Singapore will also assume responsibility for certain flying units based on Singapore Island. Headquarters No. 230 Group was formed on March 1st, 1952, to supervise the administrative control of R.A.F. Stations Seletar and Changi, plus a number of associated units on Singapore Island, and was established to relieve the A.O.C. Malaya, of certain administrative commitments, not directly connected with his main responsibility, for the direction of the air operations in Malaya.

Farewell to No. 8 R.F.C. Woodley

WITH over three hundred members and their guests present and with "everything on the house," last Friday's farewell party of the club attached to No. 8 Reserve Flying Centre at Woodley was all that such a party should be. During the evening the A.O.C. No. 62 Group Combined Reserve Centre, A. Cdre. R. Coates, arrived and was received by the Centre's "headmaster," W/C. H. A. Crommelin, A.F.C.—the man who had done so much to make this Reserve Centre one of the friendliest and most efficient in the Group.

Squadron Reunion Extraordinary

AT Claridges, on Wednesday of last week, No. 56 Squadron held its reunion. The present C.A.S., Air Chief Marshal Sir William F. Dickson, attended—he was once a flight commander in the unit—as well as Marshals of the Royal Air Force Lord Trenchard and Lord Tedder.

"Flight" photograph

EXPERIMENTAL MISCELLANY: In this view of the seldom-photographed apron at Boscombe Down are two Canberra B.2s, two Vikings, two Yorks, a Shackleton M.R.2, an Anson and a Firefly. It was taken, with official permission, during the cadet visit described on page 326.

The first after-dinner speaker was W/C. Gerald Maxwell, who served with No. 56 at its birth at London Colney during the 1914-18 war, and was third only to Capt. Ball and Major McCudden in his total of enemy aircraft destroyed. In the 1939-45 war he flew Hurricanes and was station commander at Ford. A son of his also served in No. 56. He recalled for the assembled members the early days of the squadron, recounting details of the old S.E.5, of which No. 56 had the only 12 in existence when they went into France. In July, 1917, he said, they received a congratulatory memorandum from Lord Trenchard on having destroyed 200 enemy aircraft in six months.

Lord Trenchard, replying, referred to No. 56 as a wonderful squadron, the spirit of which was the condensed spirit of the whole Royal Air Force. Speaking of the earlier days, he recalled that in the first world war there were no navigation aids: and he presumed that was why so many pilots of No. 56 lost themselves and landed—near Paris.

A.V-M. the Earl of Bandon, A.O.C. No. 11 Group, under which No. 56 Squadron now operates, was very complimentary about the unit's recent achievements. In the last twelve months, he said, they had created a Fighter Command record by putting in 6,207 flying hours, without an accident of any description.

S/L. R. Spooner, the present commanding officer, spoke of his consciousness of the squadron's deep roots and how its achievements were used as yardsticks by which the other units were judged. Turning with a smile to Sir William Dickson, he said, "In No. 56 even flight commanders become Chiefs of the Air Staff."

G/C. Hugh Dundas, war-time C.O. of No. 56, then surprised the company by telling them that the C.A.S. was a great-great-great-grandson of Lord Nelson, and pointed out that the fighters and bombers of the present day were as important as were Nelson's ships in their time. To this Sir William replied by emphasising that the R.A.F. was fighting for money for things it believed to be right. The future, he said, was so difficult to predict, and we simply must go for quality.

N.S. Commissions in R.A.F.

THE Air Ministry has announced new arrangements for the assessment of National Servicemen for commissioned service.

Those selected as having suitable qualities will be posted to a special recruits' training wing, where they are to be carefully assessed before appearing before a selection board. In addition, recruits not initially selected as suitable for commissioned service are to be carefully watched, to make sure that there is no misplacement of men better employed as officers.

Commissions are available for N.S. men in the R.A.F. Regiment (Rifle, Light Anti-aircraft and Armoured car squadrons) and in the Fighter Control, Technical, Equipment, Secretarial, Education, Catering and Physical Fitness branches of the R.A.F. Limited opportunities still exist for N.S. men to train as pilots.

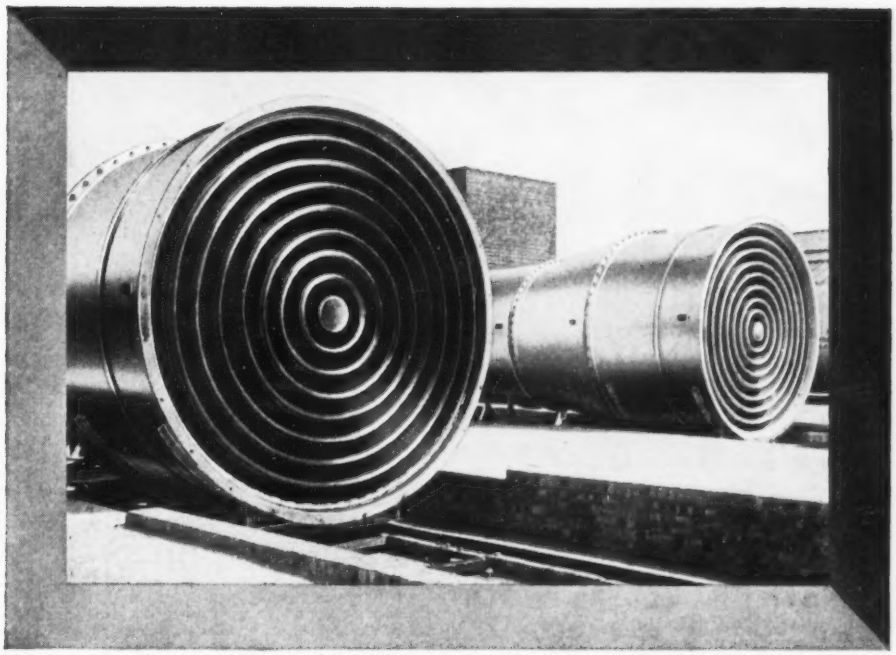
Reunions

ANOTHER reunion of R.A.F. and W.A.A.F. officers who served at H.Q. Flying Training Command, Shinfield Park, Reading, Berkshire, during the war will be held in London on Friday, April 24th. It is expected that Air Marshal Sir Philip Babington will be present. Particulars from S/L. A. C. Howell, 19, Bramley Road, Cheam, Surrey. Phone, Ewell 2413.

No. 3 Glider Training School Association is holding its seventh reunion, R.A.F. and W.R.A.F., at 6 p.m. on Saturday, March 28th, at The Victoria, 56, Buckingham Palace Road, London, S.W.1. Tickets (12s 6d) from Joan Sherman, 121, Ashfield Road, Southgate, N.14 (Enterprise 3978).

NO. 56 REUNITES: (Left) Three early members: W/C. G. Maxwell, Major E. Gilchrist and Capt. D. Grinnell-Milne. (Right) Between two fires: S/L. R. J. Spooner between Marshals of the R.A.F. Lord Trenchard and Lord Tedder. *(See "Squadron Reunion Extraordinary," on this page.)*

Photograph by courtesy of the de Havilland Engine Company Limited.



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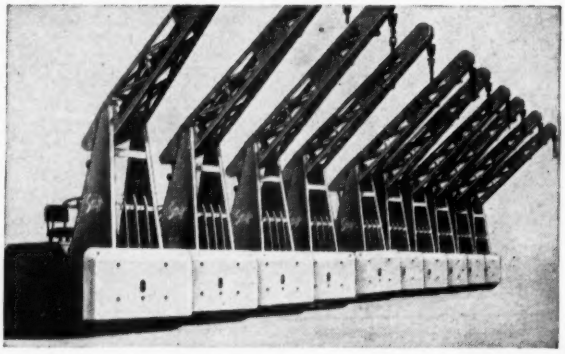

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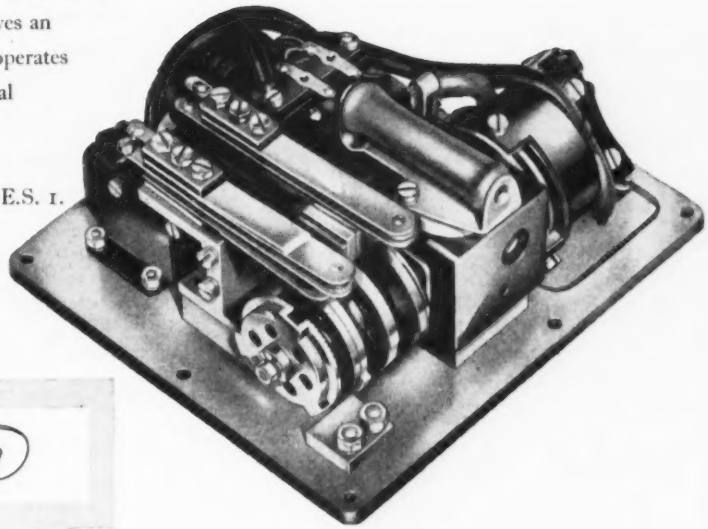

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Advertisement Rates. 4/- per line, minimum 8/-, average line contains 6-7 words. Special rates for Auctions, Contracts, Patents, Legal and Official Notices, Public Announcements, Tenders 5/- per line, minimum 10/-. Each paragraph is charged separately, name and address must be counted. All advertisements must be strictly prepaid and should be addressed to FLIGHT Classified Advertisement Dept., Dorset House, Stamford Street, London, S.E.1.

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Trade Advertisers who use these columns regularly are allowed a discount of 5% for 13, 10% for 26 and 15% for 52 consecutive insertion orders. Full particulars will be sent on application.

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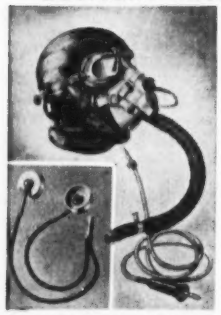

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GIPSY MOTH, registration G-ABJJ. Gipsy II engine. Current C. of A. until July.—Details from Flt. Off. W. R. Suffern, R.A.F. Bassingbourn, nr. Royston, Herts. [9368

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HANGAR (all steel) 131ft overall span x 150ft to 250ft long, clear opening 119ft 6in wide x 27ft 6in high. Doors both ends (gable end optional). Covered asbestos or steel sheets. Glazing in sides.

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ROMNEY HUTS. Suitable for airfield stores or offices. Curved buildings 35ft span, covered corrugated steel sheets. Ends as required; ex-stock.

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5 DOVES

These will fly to you individually or as a BROOD complete with nests and all auxiliary and ancillary equipment including Tails, Wings and feathers!

Of course they would prefer to go away in pairs, with an eye to future production, but provided the potential Bird-man could offer an attractive semi-detached DOVE COTtage (all mod. con. h. & c. in bdrms. etc. etc.) they might be persuaded to leave their present home.

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PERSONAL

YOUNG man wishes to borrow £1,500 to enable him to study aviation.—Box 5811. [9352

PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

APPLICATION No. 174. From Airwork, Ltd., of 15, Chesterfield Street, London, W.1, on behalf of the Committee of the Central Africa Rhodes Centenary Exhibition, to operate a special scheduled service between London and Bulawayo, S. Rhodesia, with Hermes IV, York and Viking aircraft, between May 26th and August 26th, 1953, with a total capacity of 257 seats on seven flights southbound and 221 seats on five flights northbound, 47 seats in each direction to be sold at fares of £100 single and £180 return, and the remainder of the seats at fares of £80 single and £162 return. On the flights operated with Hermes and York aircraft it is proposed that passengers shall be carried between Livingstone and Bulawayo by the Central African Airways Corporation.

APPLICATION No. 175. From Channair of 32, Hillgrove Street, St. Helier, Jersey, Channel Islands, for an all-freight service with Miles Aerovan aircraft, for the carriage of freight between London (Croydon) and Dinard, with intermediate traffic stops at Shoreham, Alderney, Guernsey and Jersey, at a frequency of from one to seven services weekly, during the period from May 31, 1953, to May 30, 1960.

APPLICATION No. 176. From Channair of 32 Hillgrove Street, St. Helier, Jersey, Channel Islands, for an all-freight service with Miles Aerovan aircraft for the carriage of freight between Cardiff and Dinard with intermediate traffic stops at Exeter, Alderney, Guernsey and Jersey, at a frequency of from one to seven services weekly during the period from May 31st, 1953, to May 30th, 1960.

APPLICATION No. 177. From Flightways, Ltd., of Southampton Airport, Eastleigh, Hants, for a normal scheduled service initially with Dakota aircraft and later possibly with D.H. Heron aircraft for the carriage of passengers, supplementary freight and mail between Southampton (Eastleigh) and Tangier, with intermediate traffic stops at Madrid and Seville (on demand) at a frequency of from one to three services weekly, increasing to one service daily during the period July 1st, 1953, to June 30th, 1963.

THESE applications will be considered by the Council under the terms of reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to these applications must be made in writing, stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9, Buckingham Gate, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, must reach them within the period allowed for the making of representations or objections. [9371

TUITION

ARE YOU AVIATION MINDED?

HAVE you got your Civil Pilot's Licence? Now is the time to study, either by personal postal means or by attending at our lecture premises. Vacancies for direct tuition very limited owing to heavy bookings. Apply immediately. We wish to announce to prospective candidates that the following dates have been arranged for commencement of direct tuition courses:—

	Commence	*Examination*
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	April 13th	August
Conversion to A.L.T.P.	March 9th	April
	April 13th	May
Flight Navigator	March 9th	September

THE above courses are offered at the direct tuition rates of 5 grs. per week and include fully illustrated lecture notes. Special terms of 3 gns. per week for those who have completed full courses and require study for specific subjects under supervision.

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EALING, W.5.
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GEMINI aircraft, fitted radio, £6 per hour, dual or solo. Southend Flying School, Essex. Rochford 50204. [0333

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DETAILS of the numerous *ab initio* and conversion courses available will be forwarded on application to the Commandant, Air Service Training, Ltd., Hamble, Southampton. [0470

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SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

UNION OF SOUTH AFRICA

VACANCIES: DIVISION OF CIVIL AVIATION, MINISTRY OF TRANSPORT

APPLICATIONS are invited for the following vacancies on contract for a period of five years in the Division of Civil Aviation:—

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Applicants must be qualified Aeradio mechanics and have served a five years' apprenticeship or have had six years appropriate experience in radio and/or radar engineering work.

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SUCCESSFUL applicants will be entitled to free transport for themselves, wives and dependent children from place of residence in the United Kingdom to South Africa and return on completion of contract.

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A LARGE engineering company situated in the eastern suburbs of London invite applications for the undermentioned appointments:—

DESIGN engineer experienced in the design and development of automatic machinery.

SENIOR designer with experience in the design of pumps, control valves and other hydraulic equipment for industrial and aircraft use.

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THE successful applicants will be capable of doing original development and investigation work and producing analytical technical reports.

SENIOR draughtsmen with experience to cover the above-mentioned fields.

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EXPERIENCE on the service radio and radar equipment would be an advantage.

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CANDIDATES applying should be fully conversant with M.O.S. and A.R.B. procedure in respect of publications, spares, appendix "A," and should also possess a good working knowledge of printing and typography requirements. Applicants should, preferably, be qualified illustrators. Good welfare facilities, including canteen and staff pension scheme.

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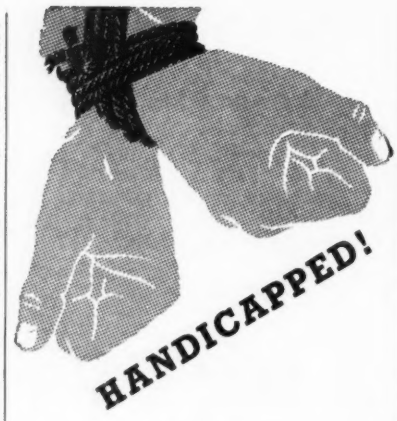

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(5) Fuller details and application forms may be obtained from Director (P), Naval Education Service, Admiralty, London, S.W.1. [9350

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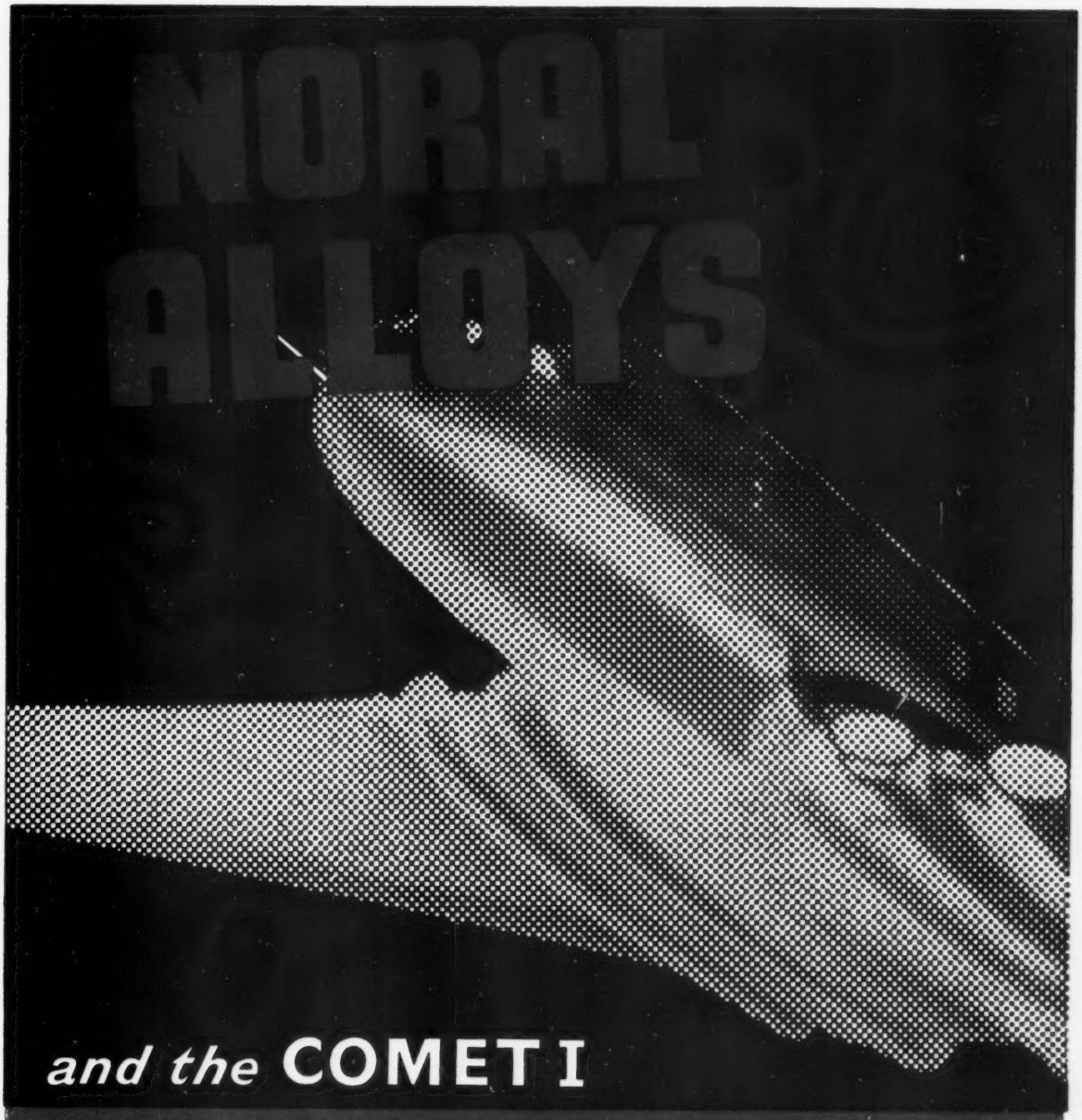

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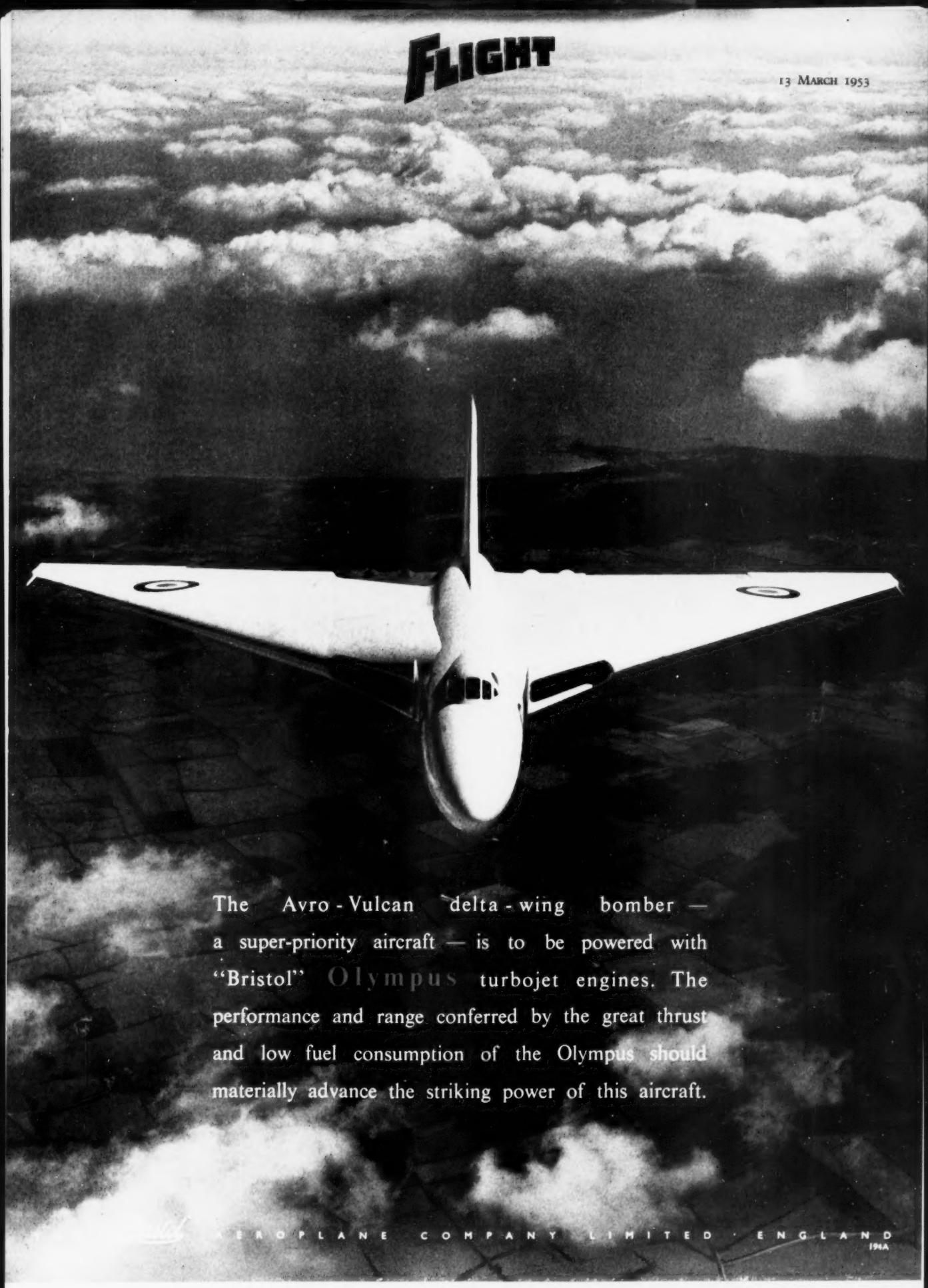

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